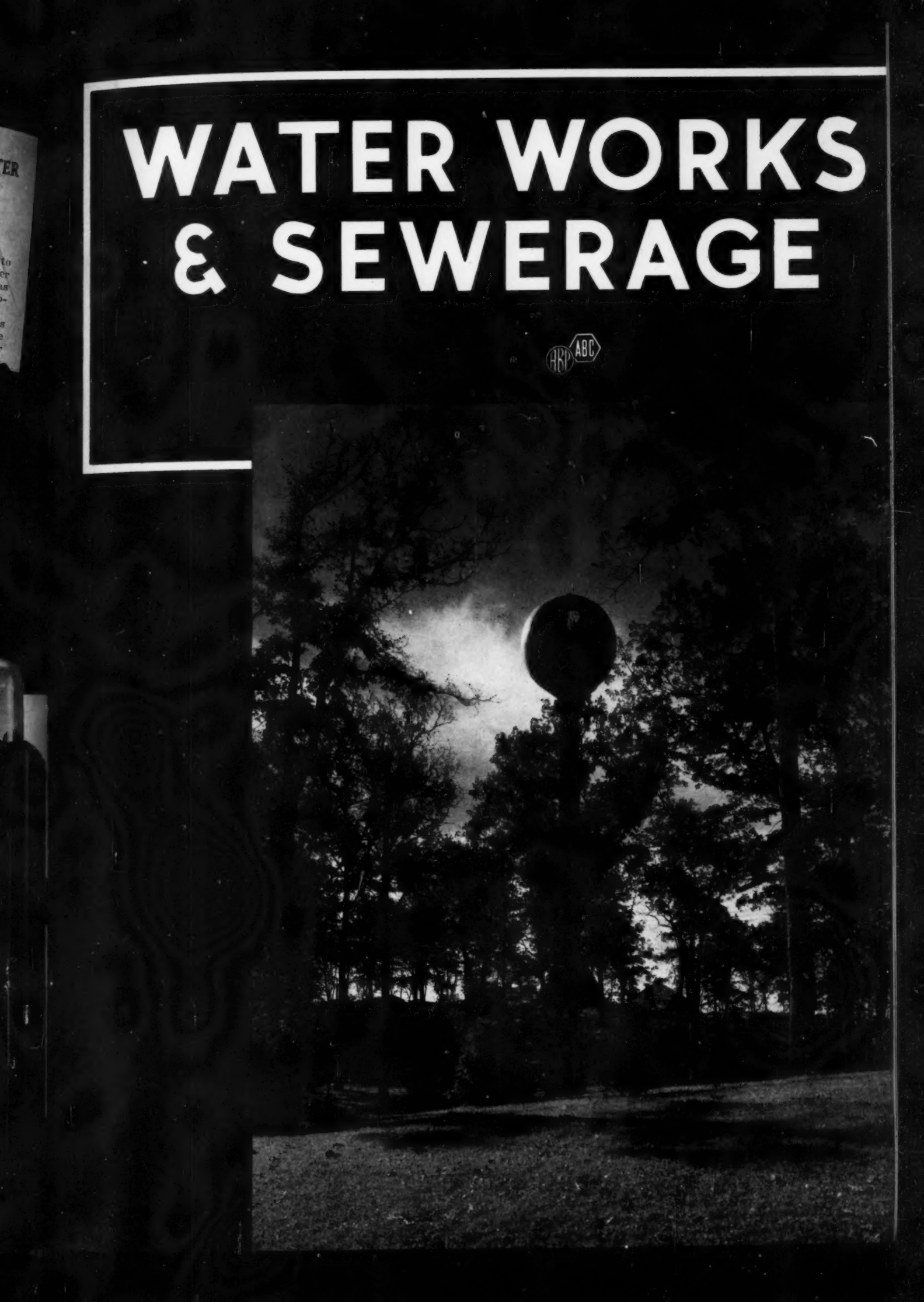
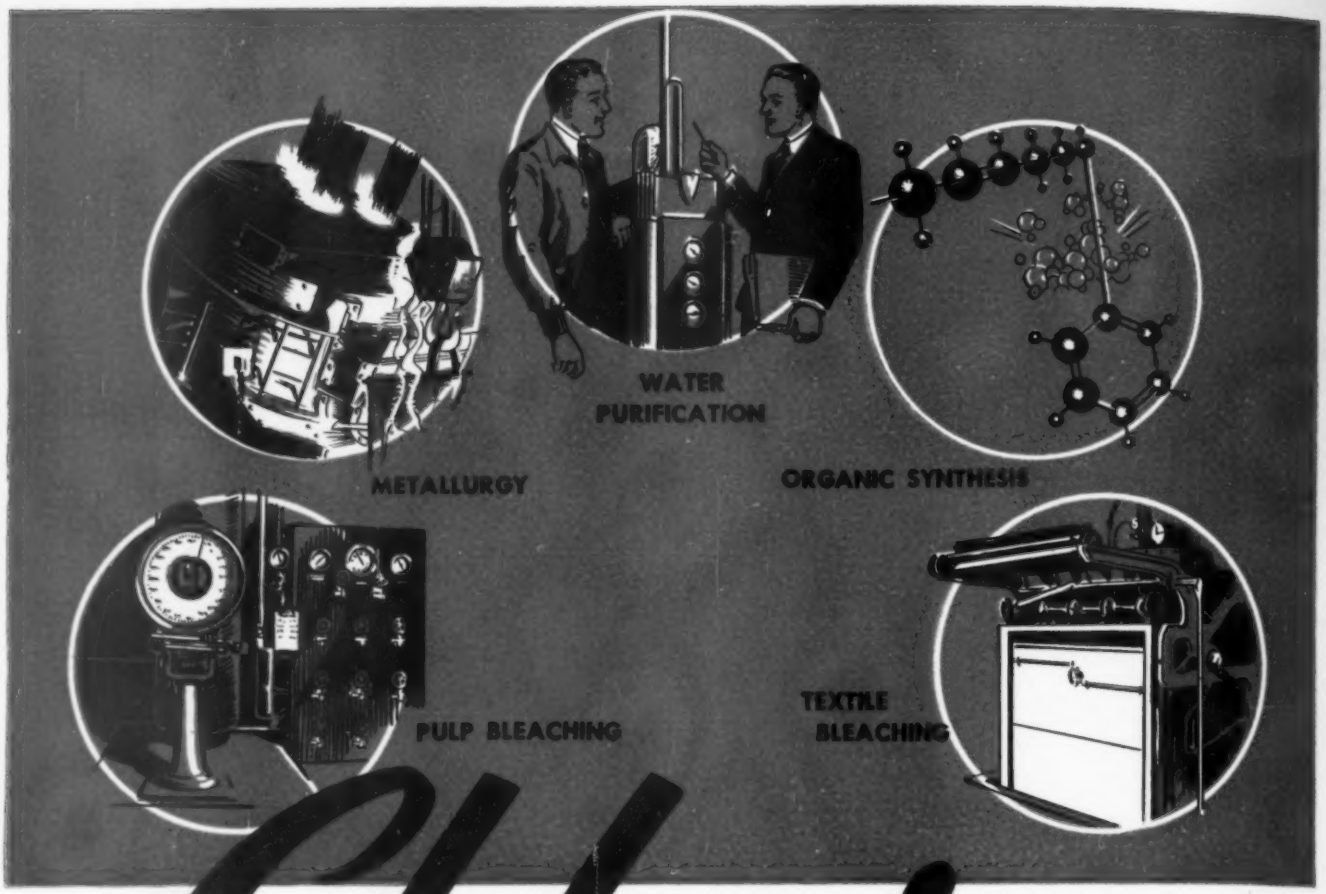
WATER WORKS & SEWERAGE





Chlorine

CHEMICAL SERVANT EXTRAORDINARY

In a century and a half of industrial development chlorine has become one of man's most useful chemical servants. Its first commercial application was made in 1799 by Charles Tennant, who manufactured bleaching powder for textile manufacturers.

In 1800 Tennant produced a few tons of bleaching powder. Today chemical plants in America are turning out well over a million tons of chlorine—much of which has been drafted for wartime military and industrial effort.

Penn Salt pioneered in the production of liquid chlorine, being first to manufacture it in commercial quantities. The first tank car of this essential chemical was shipped from our Wyandotte, Michigan, works in 1909. Our operations have continued to expand since that time until today our Wyandotte and Tacoma works are among the largest chlorine producers in the United States.

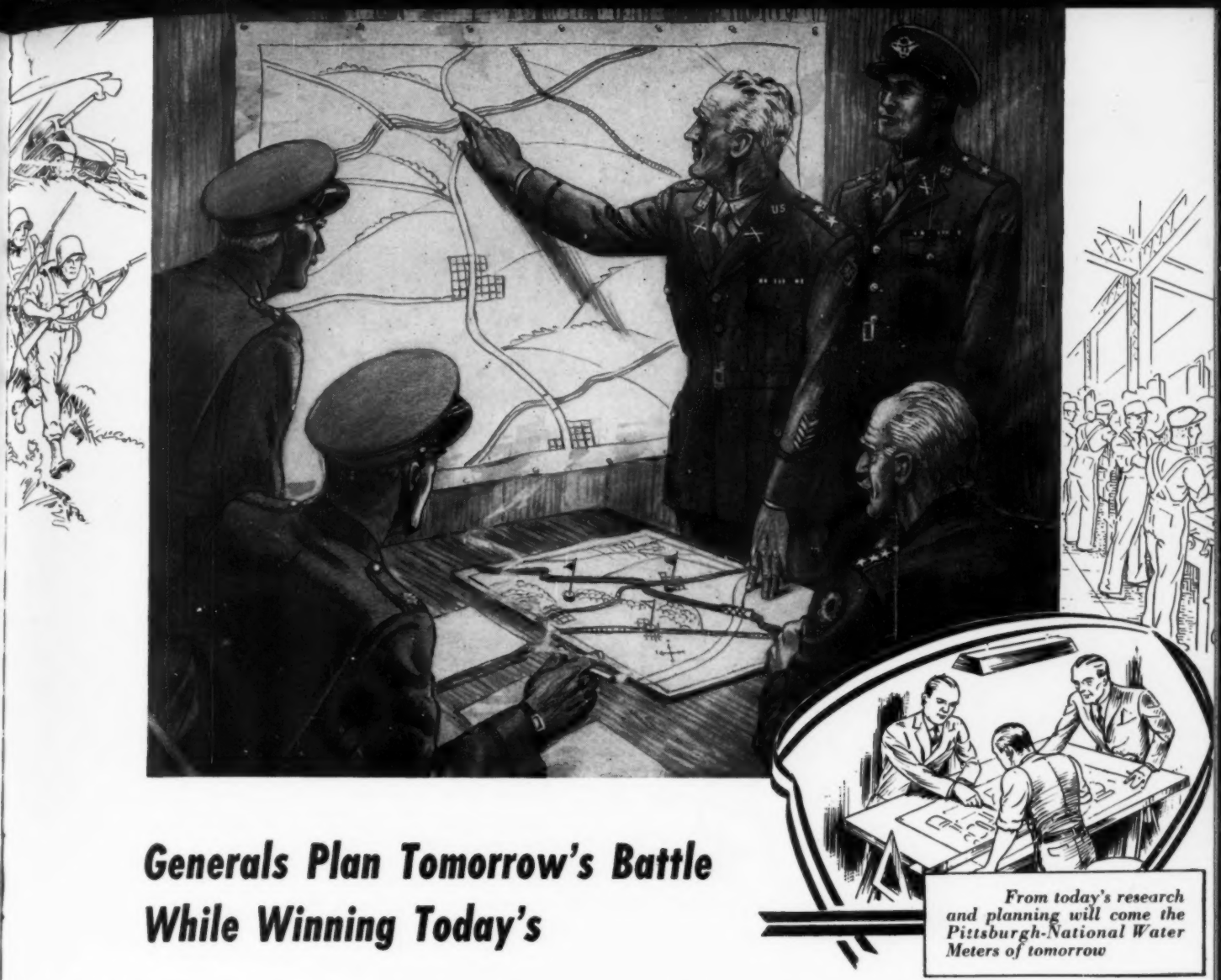
As a result of our increased production of chlorine for today's wartime uses, we are able to look forward to the promise of even greater peacetime possibilities.

PENNSYLVANIA SALT
MANUFACTURING COMPANY
Chemicals
1000 WIDENER BUILDING, PHILADELPHIA

BRANCH OFFICES: NEW YORK • CHICAGO • ST. LOUIS • PITTSBURGH • WYANDOTTE • TACOMA
PLANTS: PHILADELPHIA • EASTON • NATRONA • WYANDOTTE • TACOMA • PORTLAND, ORE.

CHEMISTRY IS THE KEYSTONE OF INDUSTRY

WATER WORKS & SEWERAGE, May, 1943. Volume 90. Number 5. Published monthly by Gillette Publishing Co., 330 South Wells Street, Chicago, Ill. Per copy, 25c. Subscription rate, United States, $2.00 per year; Canada, $2.00 per year; Foreign, $3.00 per year. Entered as Second Class Matter, June 2, 1931, at the Post Office at Chicago, Ill., under Act of March 3, 1879.



From today's research and planning will come the Pittsburgh-National Water Meters of tomorrow

Generals Plan Tomorrow's Battle While Winning Today's

ON the far-flung battle fronts of the World, brave United States Soldiers, Sailors and Marines are being directed by military strategists in waging the most scientific war ever fought. This is a war of men and machines. Weighted in our favor is the fact that our machines are products of the same industrial ingenuity that has made America the greatest nation of them all—the men who use them are those who, both by heritage and training, will provide the skilled hands to guide the way to ultimate victory.

Planning ahead is important. Sooner or later the war will end and the Water Works Industry and the manufacturing firms who supply equipment must be prepared to meet the changed conditions and ensuing problems that the cessation of hostilities will bring.

That we may keep to the forefront of progress, the research and development program of the Pittsburgh Equitable Meter Company and Merco Nordstrom Valve Company has been greatly accelerated. Our postwar planning is beyond the formulative stage. To be sure, the war must first be won, and to this end the productive capacities of our plants are now devoted, but like generals, industry, too, must plan for tomorrow's battle while winning today's. We all must take steps to insure that the things for which we are fighting will be perpetuated in a better peacetime world to follow.

We're Helping Win Today's Battles, Too!

The normal peacetime business of this company and its subsidiaries is designing and building meters, valves, regulators and similar equipment for measurement and control. At present the production of our five factories is entirely devoted to direct war goods and high priority items that contribute to essential military, naval and civilian services.

PITTSBURGH EQUITABLE METER COMPANY

NEW YORK · BROOKLYN · DES MOINES · MEMPHIS · OAKLAND · TULSA · CHICAGO · BOSTON

MERCO NORDSTROM VALVE COMPANY
Main Offices, Pittsburgh, Pa.

NATIONAL METER DIVISION, Brooklyn, N. Y.

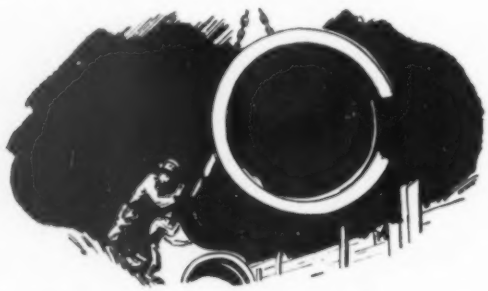
KANSAS CITY · PITTSBURGH · SAN FRANCISCO · LOS ANGELES · SEATTLE · HOUSTON · COLUMBIA · BUFFALO

Water Meters

When the Whistles

will your Plans for Improvements be ready?

Preparedness for peace—complete, detailed plans for war-deferred water supply, gas and sewage works construction



—is a practical and patriotic contribution to the Nation's post-war welfare.

* * *

War demands have made it impossible to carry on normal improvements and extensions to these vital services. In some instances where construction could not be deferred, materials have been used which would not ordinarily be considered for permanent construction. Authorities estimate that more than a billion dollars of such improvements, extensions and replacements, necessary to public health and safety, has been deferred.

This reservoir of accumulated public works represents millions of man-hours of employment for returning soldiers and jobless war workers.

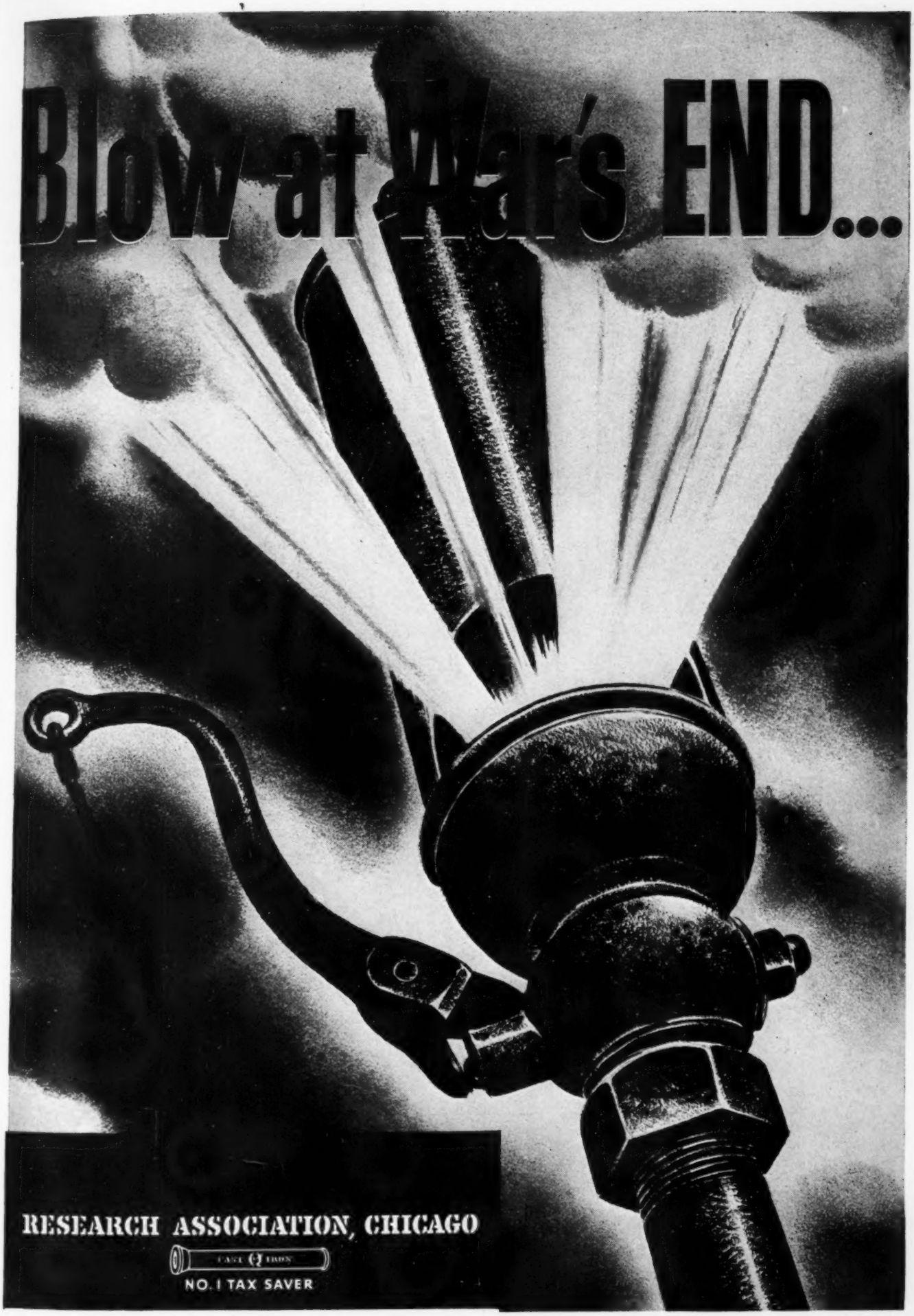
* * *

The time to prepare working plans and specifications for improvements, for extensions, and for replacement of temporary construction with permanent materials, is NOW, when engineering departments and consulting engineers are not rushed with work. Plans in readiness will save months of delay at a time when the transition from wartime to peacetime economy will be the Nation's number-one problem.

* * *

Any of the members of this Association will furnish promptly information and advice in the preparation of specifications taking full advantage of the greater economy and efficiency of cast iron pipe made in accordance with the new A. S. A. Law of Design*—pipe scientifically designed for your specific service requirements.

* **Developed under the auspices of the American Standards Association in cooperation with the American Gas Association, American Water Works Association, New England Water Works Association, American Society for Testing Materials and the members of Cast Iron Pipe Research Association.**


Blow at War's END...
RESEARCH ASSOCIATION, CHICAGO
NO. 1 TAX SAVER

Conservation Sounds a Patriotic Call

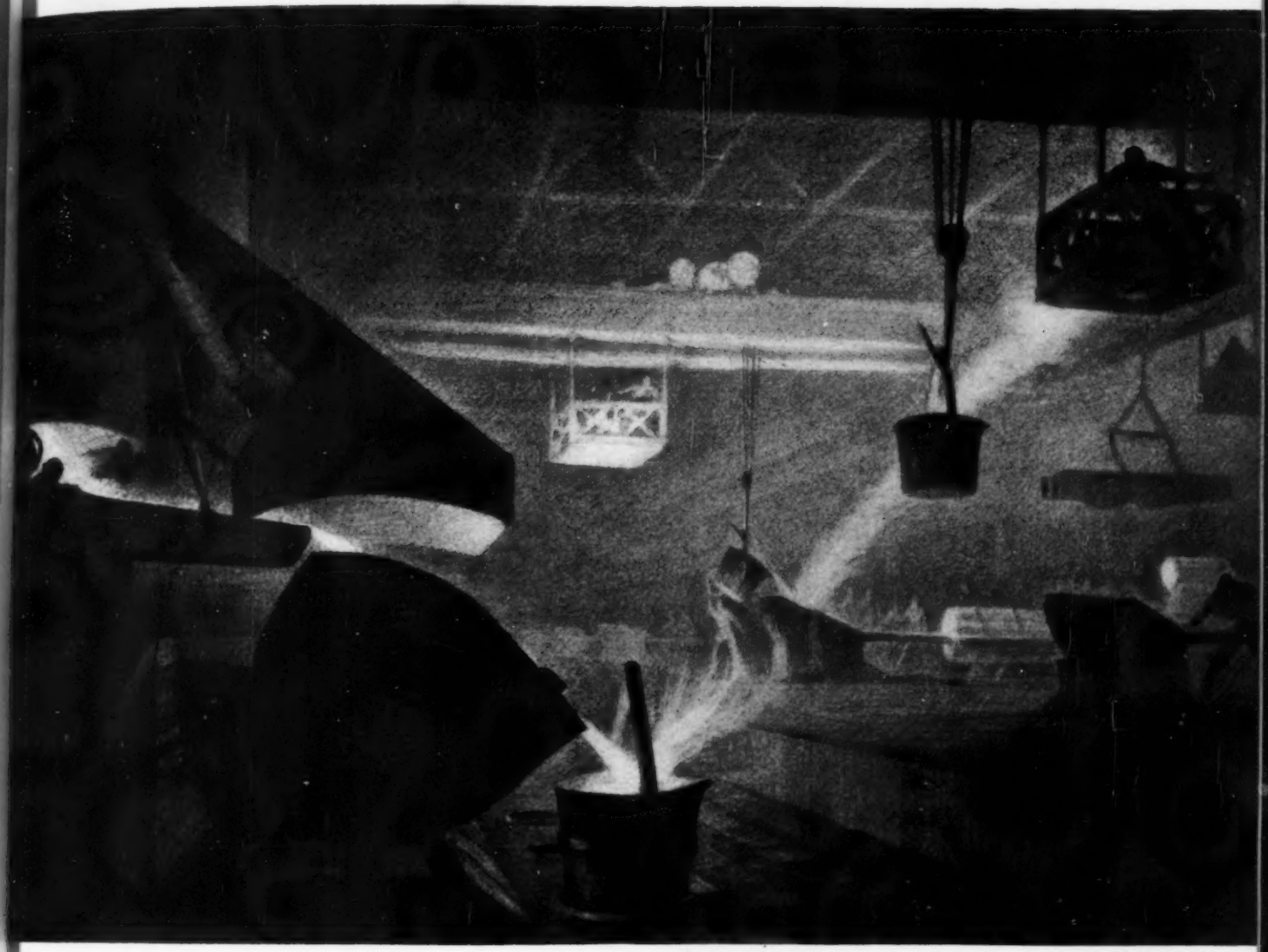
CONSERVATION of meters is a patriotic duty. The Water Works Superintendent has a double conservation responsibility—first to conserve water and second, to conserve equipment. He must take steps to put water meters in "good as new" condition so that they can continue to curb waste and protect revenue.

Those farsighted communities which invested in Badger Water Meters will be faced with less expense in their adjustment and repair programs. . . . Badger's low maintenance cost — as little as 1c per meter per year in many communities — is vital today — not only to present users but to those who are planning to put in meters to conserve water and save revenue.

BADGER METER MANUFACTURING CO., MILWAUKEE, WIS.

Branch Offices: New York City • Tampa, Fla. • Seattle, Wash. • Savannah, Ga. • Kansas City, Mo. Marshalltown, Iowa • Waco, Texas • Los Angeles, Cal. • Chicago Ill. • Philadelphia, Pa.

The Forehearth

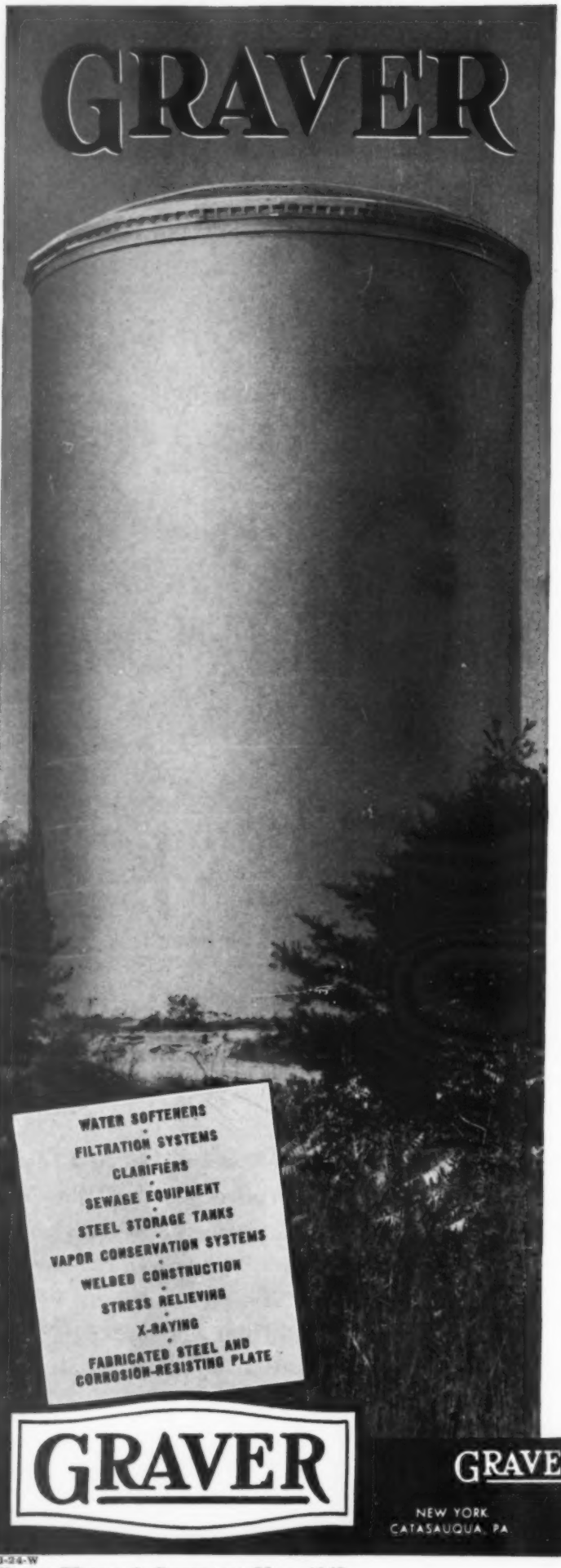


A forehearth in one of our foundries — drawn by Hugh Ferriss.

Molten iron is pouring from the forehearth into a ladle which will be picked up by a crane hook and carried to a Super-de Lavaud centrifugal casting machine. All raw materials in the melt have been inspected and laboratory-checked. The analysis, predetermined. Then, as a further precaution, to insure uniformity of both analysis and temperatures in cupola operation, the molten metal is accumulated and mixed in 12-ton reservoirs called *forehearths*. Variations in speed of melting, iron composition and temperature are thereby reduced to a minimum. This is one of a series of controls in operation at each of our plants, beginning with inspection and analysis of raw materials and ending with tests of the finished cast iron pipe.

UNITED STATES PIPE & FOUNDRY CO.

General Offices: Burlington, New Jersey. ***Plants and Sales Offices throughout the U. S. A.***



Stand Pipes

Stand the Test of TIME AND SERVICE

★

All over the country you'll find Graver-built Stand Pipes serving communities both large and small. Some will show the marks of recent construction, while others — many of them — have been in constant use for more than a quarter of a century and are still good for years to come.

Graver builds stand pipes of any capacity, either welded or riveted, to meet the most rigid municipal or industrial requirements. If today's increasing demands are putting a strain on your present equipment, consult Graver. We will gladly discuss your problems with you and submit quotations without obligation.

Write Graver — today.

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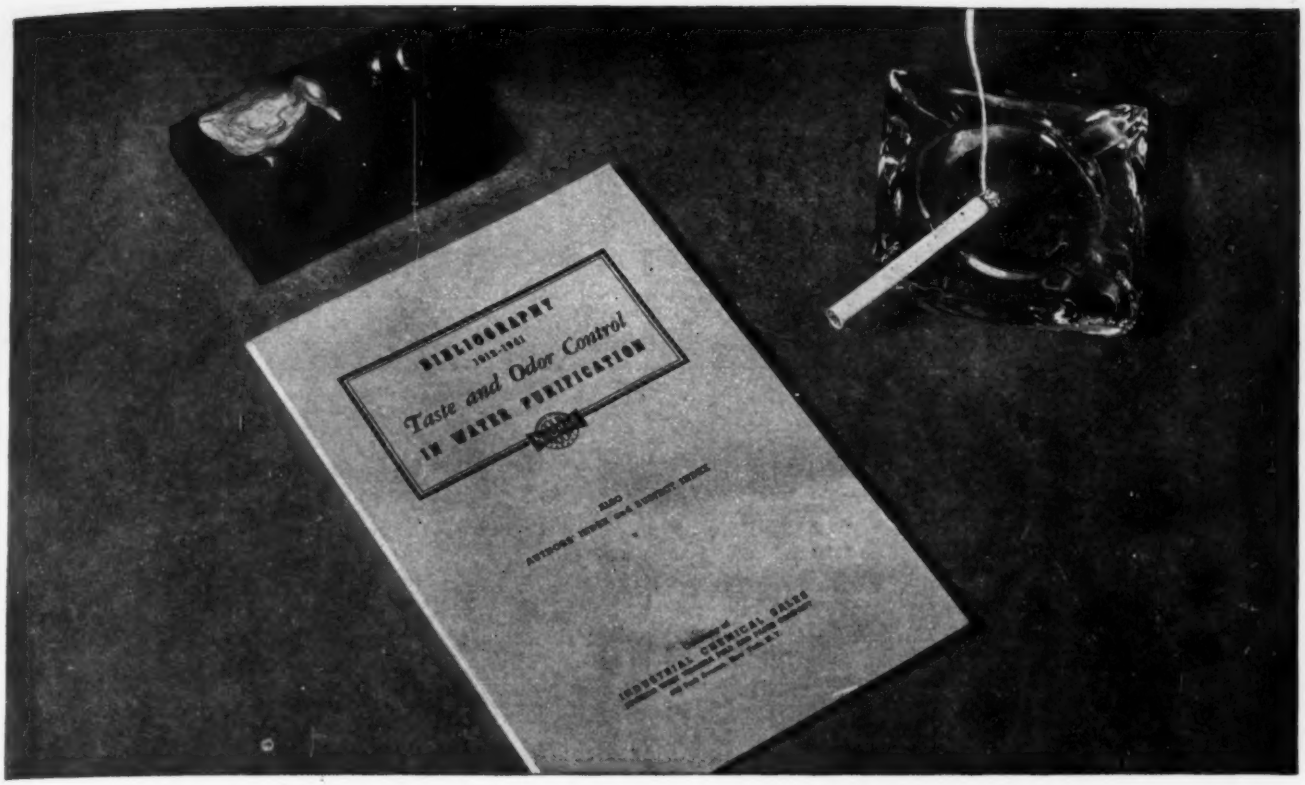

On your desk in 24 HOURS

Here is a bibliography of "Taste and Odor Control in Water Purification" from 1912 to 1941 which is yours for the asking. This covers nearly 900 articles, and contains authors' index and subject index attractively bound in a size that is easily filed.

If you are interested in taste and odor control in water purification and do not receive our monthly journal, advise us at once and we will include your name on our mailing list. Of course there is no obligation.

Yes! its yours for the asking

If you plan to attend the conference on War Winning Water Works Operation at the Carter and Statler Hotels, Cleveland, Ohio, June 15th-18th, here are two helpful suggestions:

1: Make hotel reseravtions promptly.

2: Arrange transportation and be sure that return Pullman space is secured.

☐ Please send me bibliography of "Taste and Odor Control".

☐ Please include my name on your mailing list to receive your Taste and Odor Control Journal each month.

Name .....

Address .....

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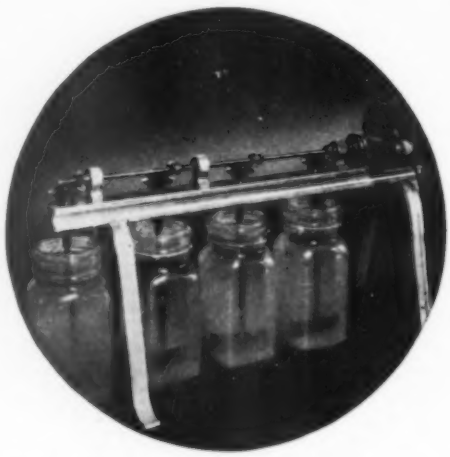
Industrial Chemical Sales Division
West Virginia Pulp and Paper Company
35 E. Wacker Drive, Chicago, Illinois

THREE WAYS TO CONSERVE FERRISUL ...AND STILL MAINTAIN PLANT EFFICIENCY

To the scores of water and sewage treatment supervisors who have increased plant efficiency and solved many a knotty treating problem with the use of Ferrisul . . . here are a few useful hints on how to make the most economical possible use of this effective, highly flexible coagulant.



1. On water or sewage, it pays to make frequent, careful laboratory jar tests. In most plants conditions change frequently, often daily or even hourly. Only in this way can you be sure of maintaining the right pH for the most efficient use of Ferrisul and of using the minimum dosage.

2. Check your feeding equipment to make sure Ferrisul is dissolving completely. If you use dry feed equipment, when shutting down (1) stop the dry feeder and water feeder simultaneously and (2) continue agitation for at least thirty minutes so no undissolved Ferrisul is left.

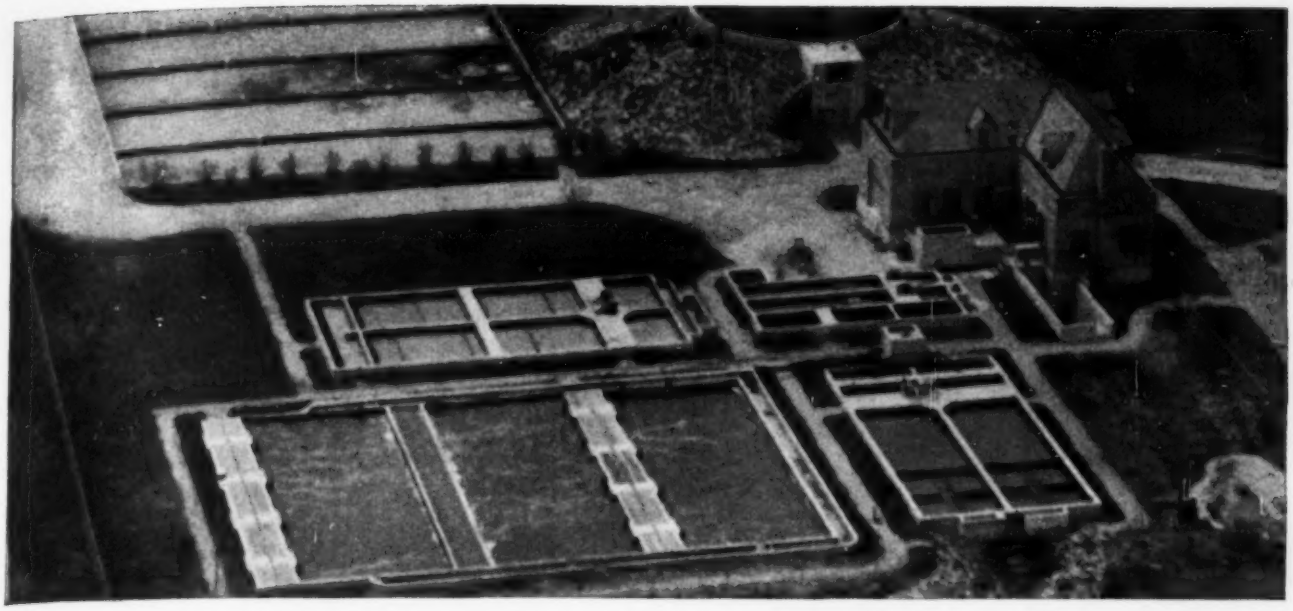
3. Ferrisul, the only *anhydrous* ferric sulfate commercially available, is easy to handle and store and it will not freeze in winter nor melt and cake in summer. Ordinary care, however, should be taken to prevent damage to packages and keep from direct contact with water.

FERRISUL today is being widely used in pickling war-vital metals where it is preferred over similar chemicals for many of the same reasons that have made it a favorite in your field: (1) its higher iron content and resultant economy, (2) its greater uniformity (3) and its greater ease of storage and handling.

As a result, the demand for Ferrisul is heavy these days and it is essential that the most efficient possible use be made of every pound. If you wish, Monsanto's competent and experienced technical staff will be glad to offer specific suggestions on possible economies in your plant. For their help, inquire: MONSANTO CHEMICAL COMPANY, Merrimac Division, Everett Station, Boston, Mass.

Help! Prompt return of empty tank cars, carboys and returnable drums will help speed your *next* shipment of Monsanto chemicals . . . by helping to relieve critical shortages in shipping equipment.

MONSANTO CHEMICALS
SERVING INDUSTRY...WHICH SERVES MANKIND



Air view of Celina, O., sewage treatment plant. Paul A. Uhlmann, Columbus, O., Engineer.

Unusual Combination of Cannery and Creamery Wastes and Domestic Sewage Given Complete Treatment at Celina, O.

97% Average B.O.D. Reduction in 1942 Made Possible by Flexibility of Chicago-Equipped Activated Sludge Plant.

Summary of Operating Data for 1942
Celina, O., Activated Sludge Sewage Treatment Plant

Month	Average Daily Flow M.G.D.	5 Day B.O.D. p.p.m.			Suspended Solids p.p.m.			Cannery and Creamery Wastes	
		Raw	Final	% Reduction	Raw	Final	% Reduction	Canning Hours	Milk 1,000 lbs.
Jan.	.405	811	30.7	96.2	548	74	86.5*	253	16.0
Feb.	.638	635	42.3	93.3	371	90	75.7*	312	5.0
Mar.	.835	618	16.0	97.6	317	14	95.9	0	23.5
Apr.	.870	382	7.9	97.9	336	15	95.5	39	8.0
May	.701	741	11.2	98.5	415	17	95.9	0	252.0
June	.588	752	20.7	97.2	465	26	94.5	160	195.5
July	.556	566	6.4	98.8	512	20	96.2	133	13.0
Aug.	.560	483	2.3	99.5	538	13	97.6	192	0
Sept.	.584	703	18.9	97.3	434	68	84.3	318	0
Oct.	.427	616	10.9	98.2	459	19	96.0	165	6.0
Nov.	.431	430	18.0	95.8	397	15	96.3	43	0
Dec.	.517	524	17.9	96.6	231	7	97.0	0	0

*Only two aeration tanks operating during unanticipated and unusually heavy bean pack.

"One of the toughest and most interesting problems," Paul A. Uhlmann, consulting sanitary engineer, says of the Celina plant.

Large amounts of creamery wastes, stearic acid wastes and cannery wastes composed of tomatoes, peas, hominy, beans, asparagus and other vegetables are handled.

Plant has Chicago Wide-Band Air Diffusion System with Swing Diffusers.

Write for a copy of Mr. Uhlmann's 3-year report on the operation of the Celina plant.

CHICAGO PUMP CO. SEWAGE EQUIPMENT DIVISION

2336 Wolfram Street, CHICAGO, ILL.
Phone BRUnswick 4110

VACUUM—CONDENSATION—CIRCULATING—BILGE
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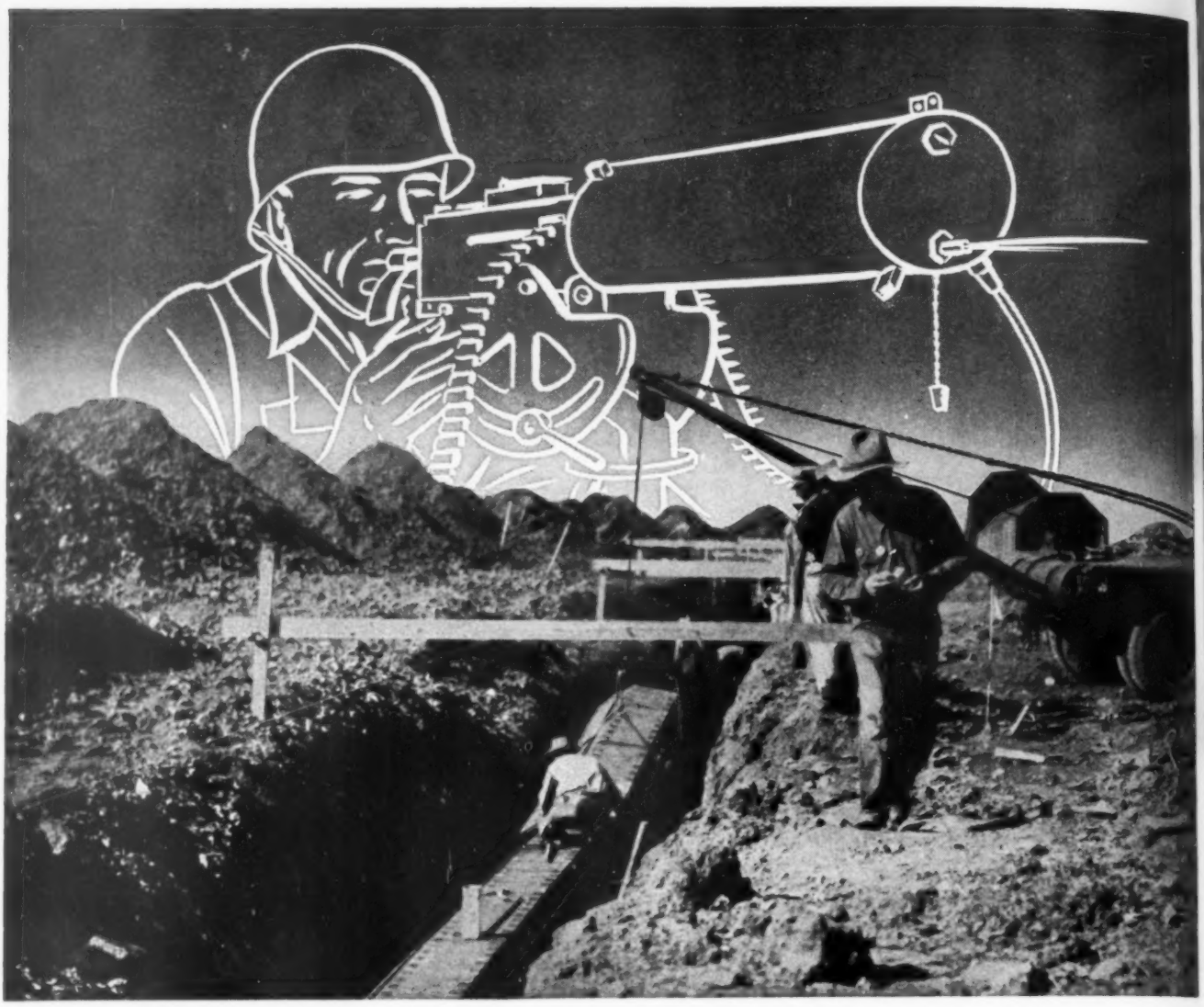
AERATORS—COMMINUTORS—SAMPLERS

REPRESENTATIVES THROUGHOUT THE UNITED STATES AND FOREIGN COUNTRIES



THIS STORM SEWER is fighting on two fronts

This and other storm sewers are doing an important job at home without the use of critical materials — thanks to ARMCO Emergency Wood Pipe. The metal it releases may even now be helping to save lives and shorten the war on a distant fighting front.

Yes, essential wartime drainage can be taken care of economically, efficiently and *patriotically*. The new design of ARMCO Emergency Pipe requires no steel sheets and bands, wire mesh, metal reinforcing or other critical material. Skilled labor is not needed. The pipe is easy to handle and install. Also important now, ARMCO Pipe is light in weight and nestable, which often means up to 80 per cent savings in transportation.

Remember that ARMCO Corrugated Metal Pipe is only on temporary "leave of absence." It will be back after the war with its flexible strength, long lengths, tight joints and low installation costs. Meanwhile, steel must not be used in any drainage structure unless engineering integrity demands it. For most of those wartime "must" jobs you'll find a highly practicable substitute in ARMCO Emergency Wood Pipe. Write us today for complete information. Address: ARMCO Drainage Products Association, 75 Curtis Street, Middletown, Ohio, U. S. A.

ARMCO **EMERGENCY PIPE**

To CONSERVE MATERIALS
...TIME and LABOR
...and to Save Money

IN YOUR BELL AND SPIGOT MAIN JOINTING

SPECIFY THE SULPHUR BASE COMPOUND THAT INCLUDES THIOKOL...SHOWS MUCH LESS INITIAL LEAKAGE AND SEALS TIGHT IN MUCH LESS THAN THE TIME USUALLY REQUIRED!

Tegul-MINERALEAD combines advantages not found in total in any other jointing compound.

- CONVENIENT 10 lb. INGOTS, so much easier to handle, ship and store
- UNAFFECTED BY MOISTURE — so is immune to rain and flood when stored in the open
- COMPOSITION CANNOT CHANGE — even under the roughest handling
- LITTLE INITIAL LEAKAGE and what there is, takes up quickly. This permits prompt back-filling and clearing up, terminating traffic hazards due to torn-up streets
- MELTS, POURS AND SETS QUICKLY
- OFFERS MUCH HIGHER RESISTANCE to mechanical and thermal shock
- ONLY PRACTICAL COMPOUND for lines carrying water at high temperatures
- NEEDS NO CAULKING or deep bell holes
- WEIGHS ONE FIFTH as much as lead. Goes three times as far
- SPEEDS LAYING and makes joints that stay tight even under severest punishment
- HELPS CONSERVE LEAD, a strategic war metal

This unmatched combination of advantages makes *Tegul*-MINERALEAD ultimately much more economical from every angle.

Get acquainted with *Tegul*-MINERALEAD now. Address our nearest branch office or, for technical literature, write us here at Mertztown.

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Stocks carried at these points

HERE'S THE FINEST "Incentive Plan" WE KNOW

• *Technical Sergeant Ben Maricle, U. S. Army Air Corps, at home on leave, congratulates his father, Frank Maricle, American Brass press operator, on the production job he is doing.*

Nobody has to remind Frank Maricle, press operator at the Buffalo plant of The American Brass Company, about the importance of all-out production for U. S. war needs. He has the best of all reminders and "incentive plans" in his son, Ben . . . U. S. Army Air Corps Sergeant.

And so it is with thousands of other American Brass workers who have sons and brothers, cousins and nephews, in the armed forces. They know they are producing not merely metals but copper and brass war materials for *them* . . . to help bring victory sooner. To date, over 3,500 former American Brass fellow workers, themselves, are serving in the armed forces of Uncle Sam.

The American Brass Company operates thirteen plants in U. S. and Canada which are working night and day on the same vital job . . . turning out the greatest volume of copper and brass in the company's history . . . every pound of it earmarked for victory. The five Army-Navy "E" pennants we've received are a challenge to still greater effort.

United America will win

As a nation and as individuals, the American people are united in fighting this war—on the battle front and on the home front . . . buying War Bonds . . . conserving rationed materials . . . making personal sacrifices . . . doing their part wherever they are.

And we can all take satisfaction in knowing that the restrictions and sacrifices of today are necessary for tomorrow's victory. For example, Everdur* Metal, Anaconda's famous copper-silicon alloy, is being produced in huge quantities—not for water works or sewage construction—but for tough war jobs. There are countless important applications, where its great strength, corrosion-resistance and rust-immunity are indispensable to the war effort.

43418

*Reg. U.S. Pat. Off.

THE AMERICAN BRASS COMPANY
General Offices: Waterbury, Connecticut
Subsidiary of Anaconda Copper Mining Company
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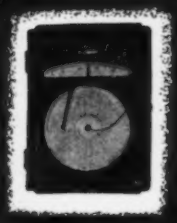
ANACONDA

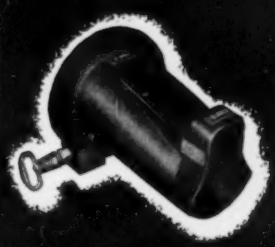
Anaconda Copper & Brass

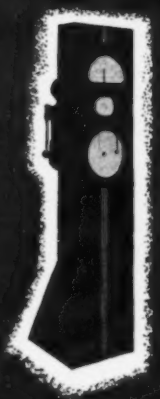
OVER 50 YEARS' EXPERIENCE

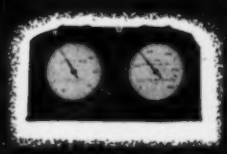
in the Design and Manufacture of Water and Sewage Works Equipment

AT YOUR SERVICE









VENTURI METERS

for Metering the Flow of Water, Sewage, Sludge, or Air Through Main Pipe Lines.

TYPE M, FLO-WATCH AND CHRONOFLO METERS

for Metering the Flow of Water, Sewage, Sludge, Gas, or Air through Medium Sized and Small Lines, Open Channels, etc.

VENTURI CONTROLLERS

for Effluent Rate, Wash Rate, Raw Sewage and Return Sewage.

FILTER GAUGES

for Loss-of-Head, Rate-of-Flow, and Sand Expansion.

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for Settling Tanks, Filters, Clear Wells, Wash Tanks, Reservoirs, etc.

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for Air/Sludge and Return Sludge/Sewage.

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for Metering Open Flow of Sewage, Sludge and Trade Wastes.

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for Flow, Liquid Level, Pressure, Temperature, and Chemical Feed Proportioning.

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for Weighing Sludge Cake in transit.

Descriptive Bulletins upon request.

A.W.W.A. Conference, Cleveland, Ohio, June 15-18

ARMY E NAVY

AWARDED AUG. 1st 1942

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37 CODDING STREET • PROVIDENCE, R. I.

BUILDERS WATER AND SEWAGE WORKS *Equipment*

Portrait of "A MIND AT EASE"

Simplex "S" Controllers have established a reputation for long, dependable service that is taken for granted by thousands of design and operating men in plants all over the country.

We receive many comments from new as well as old users telling us of the steady, behind-the-scenes job our Controllers, Fluid Counterweights, and Clear Well Shut-Offs are doing to maintain peak efficiency for overburdened operating staffs in plants whose capacities are often being taxed to the very limit.

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The recently published Simplex Bulletin 250 gives clear-cut specification data that is worth filing for ready reference. Your copy will be sent immediately without obligation.

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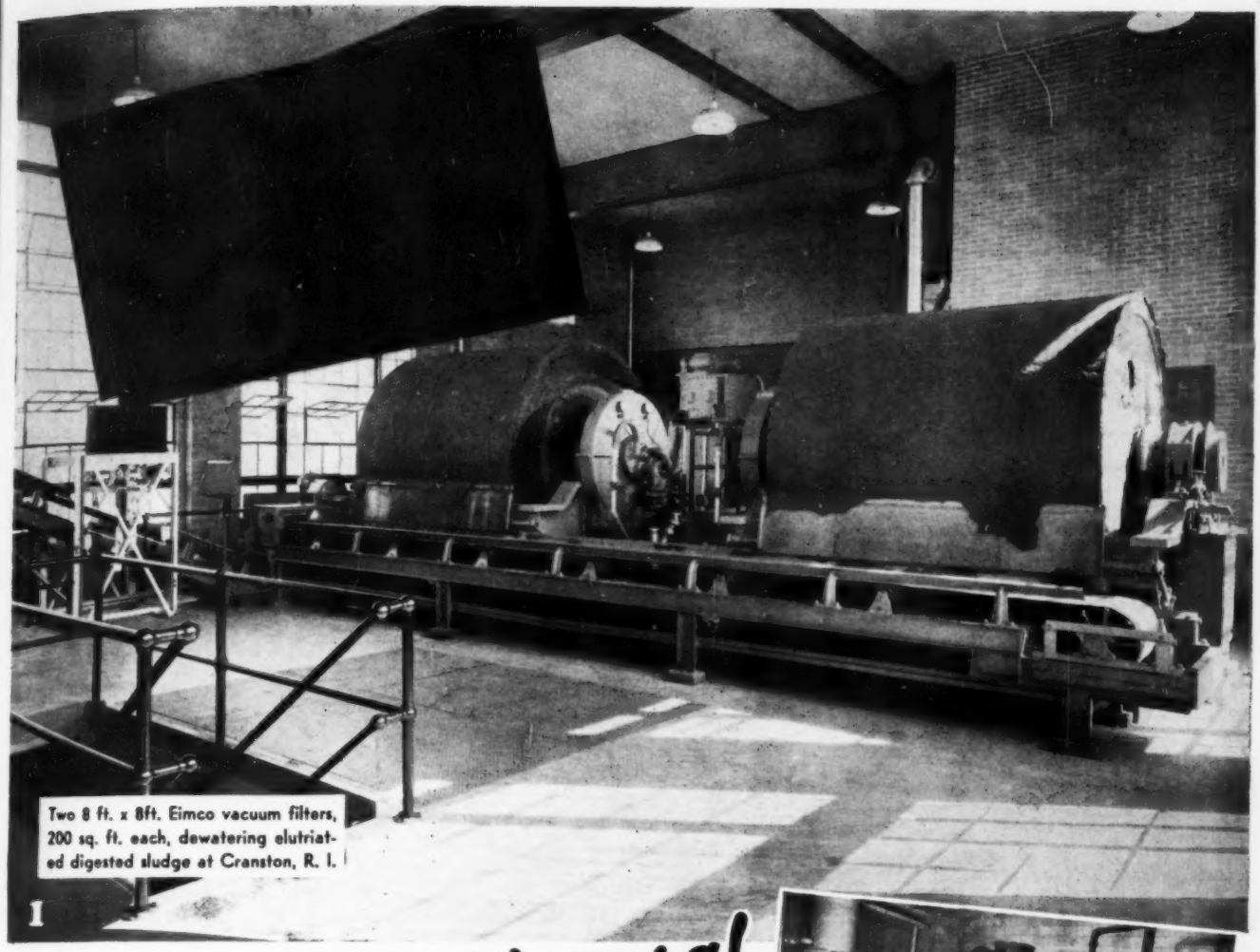
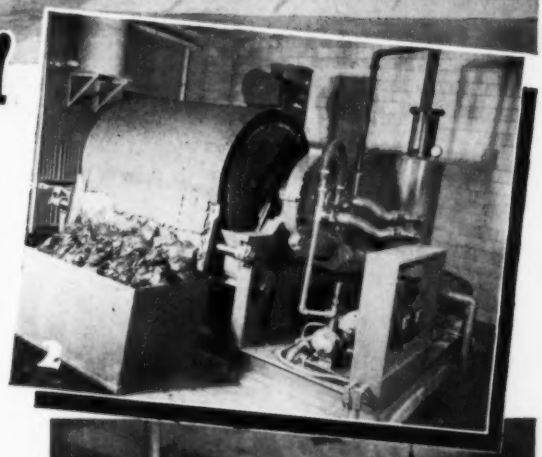


Two 8 ft. x 8ft. Eimco vacuum filters, 200 sq. ft. each, dewatering elutriated digested sludge at Cranston, R. I.

1

for Sewage Disposal

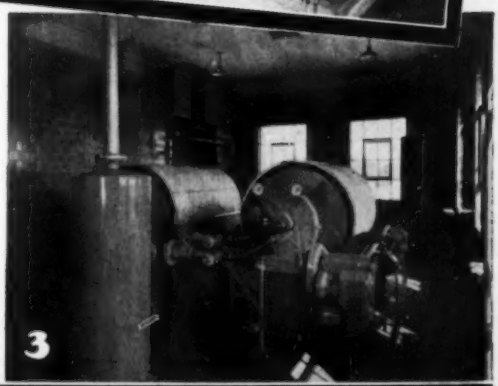


2

Cranston, Rhode Island sewage treatment plant (Fig. 1) recently finished is an example of complete equipment and engineering service furnished by Eimco in Sewage Disposal installations. Complete filtration equipment including filters, sludge conditioning equipment, conveyor and vacuum system along with detailed drawings showing piping, foundations, electrical wiring diagrams and floor inserts, were all furnished by Eimco.

Other installations may be found at numerous points throughout the nation. (Fig. 2) An installation at Birmingham, Michigan, and (Fig. 3) at Rock Island, Illinois, are among typical plants.

To be assured of superior workmanship and heavy-duty construction, call in the Eimco Engineer nearest you, or write giving details.



3

THE EIMCO CORPORATION

SALT LAKE CITY, UTAH, U.S.A.

NEW YORK	CHICAGO	EL PASO	SACRAMENTO
120 Broadway	111 W. Washington St.	Mills Bldg.	1217 7th St.

HOW TO MAKE YOUR LIQUID CHLORINE GO FARTHER...

a) Consult with Diamond Technical Service regarding your procedure in using liquid chlorine. You may discover an unsuspected means of extending your liquid chlorine, or achieving greater efficiency in its use.

b) Insist on getting liquid chlorine that is uniform and free from unwanted impurities, and comes to you in containers that best meet your requirements. In this way you can make full use of every ounce of your supply.

DIAMOND ALKALI COMPANY
PITTSBURGH, PA. and Everywhere

ALKALI

GET MORE WATER THRU YOUR FILTER WITH THE Palmer Surface Wash System

PALMER SURFACE WASH SYSTEMS are now being installed all over the country where the demand for water is exceeding filter capacity.

TYPICAL INSTALLATIONS

WASHINGTON, D. C. (Dalecarlia Plant)—supplying the nation's capital — critical because of "increased population."

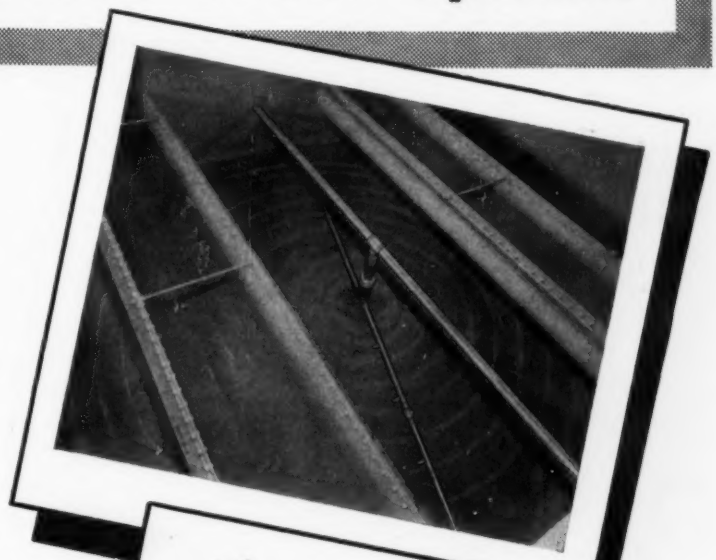
NORFOLK, VIRGINIA (Moores Bridges Plant)—the "third plant" at Norfolk to install the Palmer Surface Wash System. The demand for water here is a real problem.

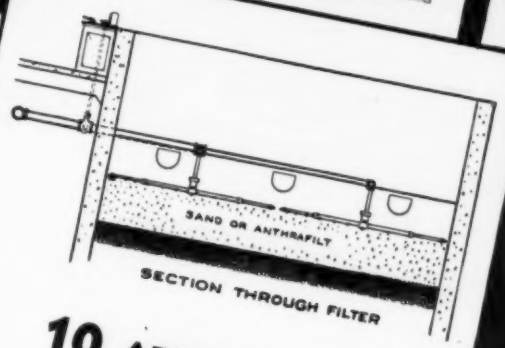
CAMBRIDGE, OHIO—an "Army Hospital" is putting an extra demand on their system.

PORTSMOUTH, VIRGINIA—23 agitators.

LOCKLAND, OHIO—16 agitators.

ELZA, TENNESSEE—16 agitators.





SECTION THROUGH FILTER

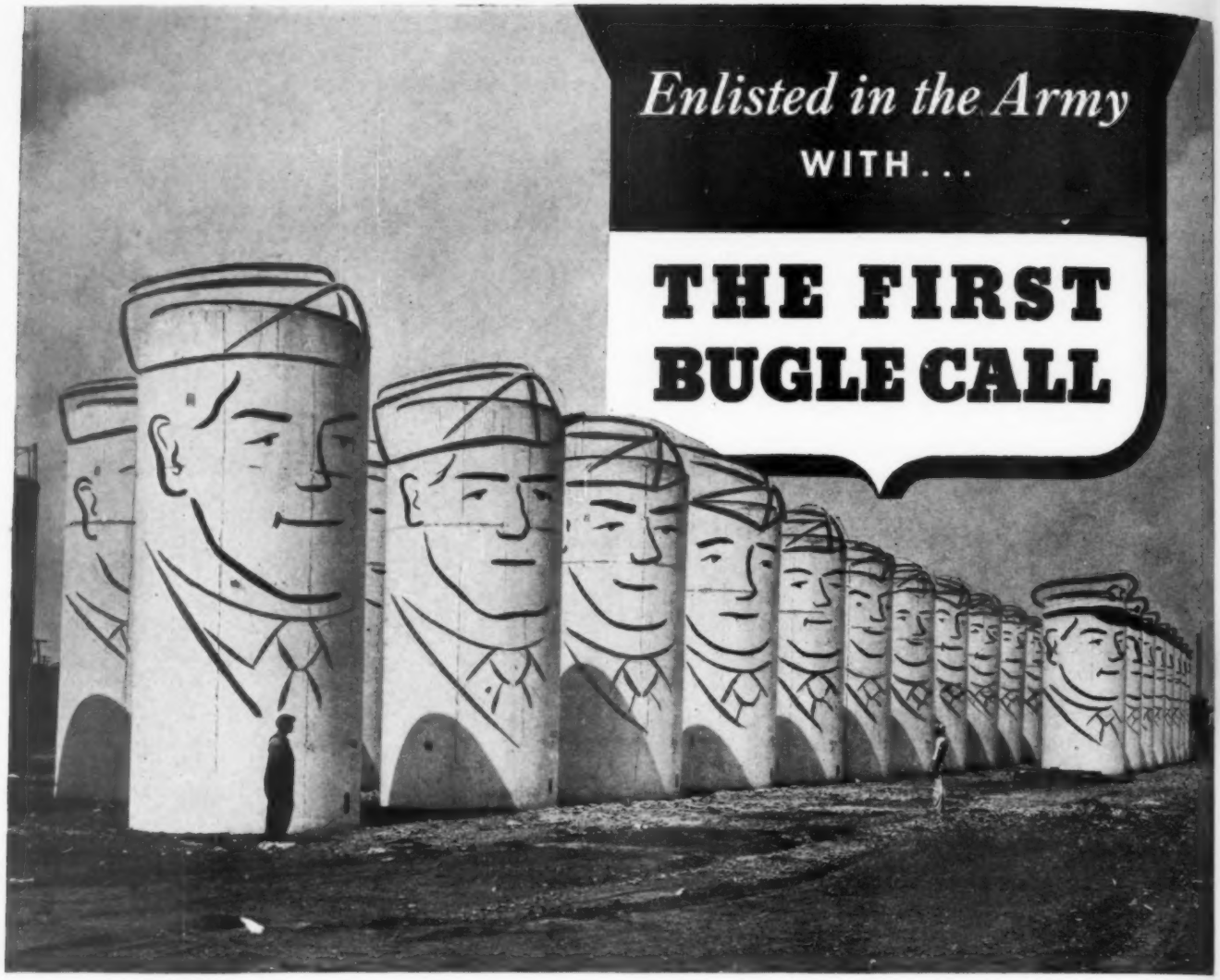
10 ADVANTAGES

- Longer filter runs
- Requires an average of 40% less wash water
- Completely eliminates mud balls
- Eliminates cracking or shrinking of the beds
- Produces NEW sand after three weeks' operation
- Turns out purer, better tasting water
- Low installation cost
- No operating cost
- More water thru the filters
- Less time out washing filters

STUART-BRUMLEY CORP.

516 N. CHARLES ST. BALTIMORE, MD.

THE PALMER FILTER BED AGITATOR



WE'RE in the Army too. With all-out effort, we're working hard on the battle of production so that water supply, sewerage and drainage can be provided for ordnance plants, arsenals, air bases, cantonments and other vital army projects.

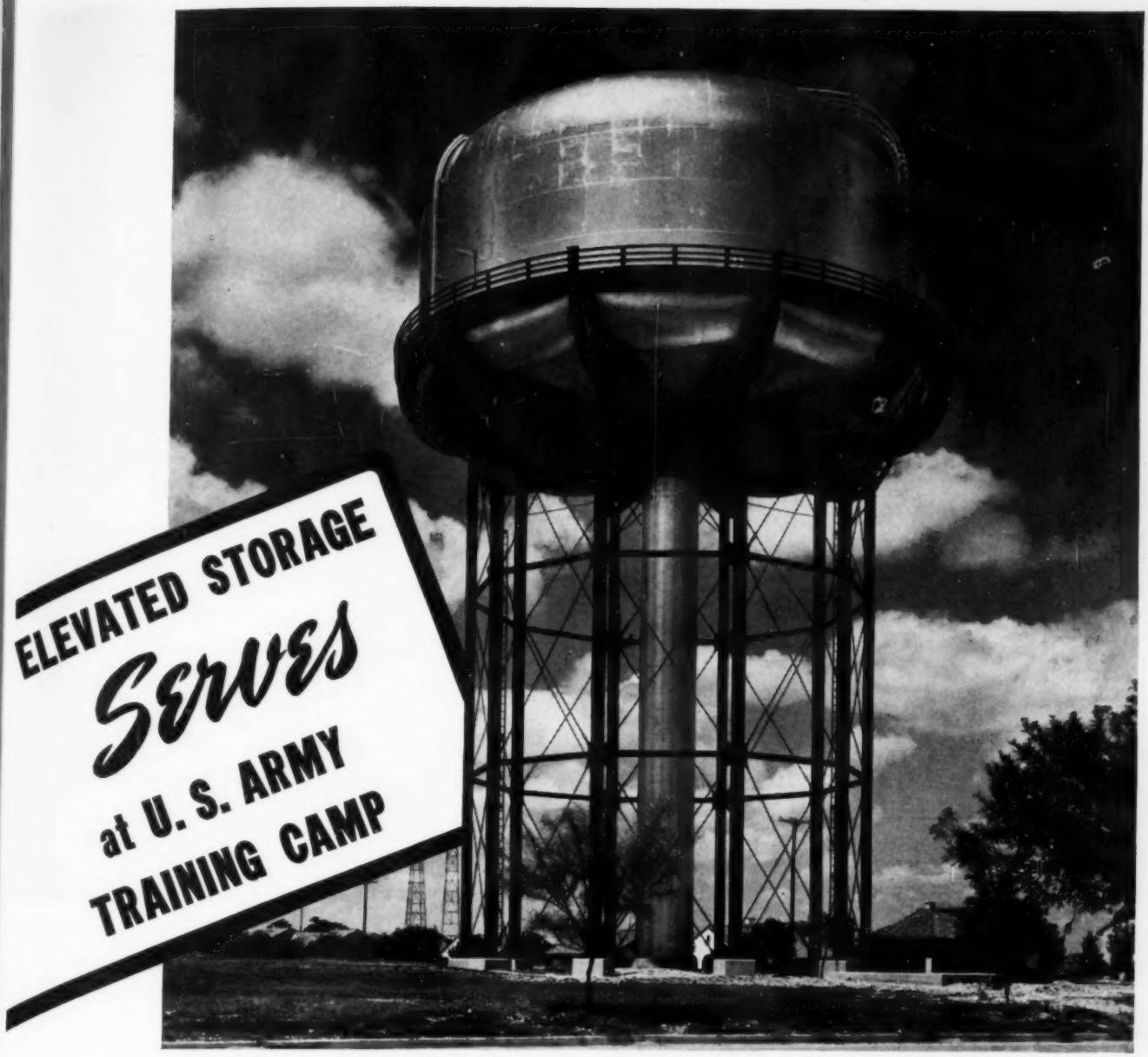
It is recognized that for large sized pipelines, Reinforced Concrete Pressure Pipe uses the least amount of critical materials and thereby makes more iron and steel available for the production of armaments. During 1941 and 1942, the use of Lock Joint Pipe caused a net conservation of 80,000 tons of iron and steel. AND all this was accomplished without any sacrifice of quality, performance or permanence.

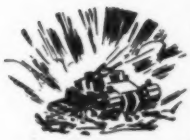
LOCK JOINT PIPE COMPANY
Established 1905
AMPERE, NEW JERSEY

Denver, Colo. · Chicago, Ill. · Kenilworth, N. J. · Kansas City, Mo. · Rock Island, Ill. White Plains, N. Y. · Valley Park, Mo. · Cleveland, Ohio · Hartford, Conn. · Navarre, Ohio

SCOPE OF SERVICES *Lock Joint Pipe Company specializes in the manufacture and installation of Reinforced Concrete Pressure Pipe for Water Supply Mains as well as Concrete Pipe of all types for Sanitary Sewers, Storm Drains, Culverts and Subaqueous lines.*

LOCK JOINT
Reinforced Concrete
PRESSURE PIPE





AT many of Uncle Sam's training camps Horton elevated tanks have become familiar sights. These units symbolize adequate water supply here, just as they have for many years in municipal waterworks systems.

The 1,000,000-gal. radial-cone Horton elevated tank shown above, is helping to protect the health of thousands of soldiers at a well-known Army post. Formerly this post depended upon two 328,000-gal. elevated water tanks for its water storage. As the garrison grew, improved water supply became imperative and this present elevated tank was erected. It is 73 ft., 6 in. to bottom; has a range in head of 35 ft.; located 6,400 ft. from the wells; and is approximately at the center of demand.

Uniform distribution pressures, provision for pumping during off-peak periods, together with an adequate reserve immediately available for fire protection . . . are some of the benefits that elevated storage tanks provide both municipalities and training camps alike.

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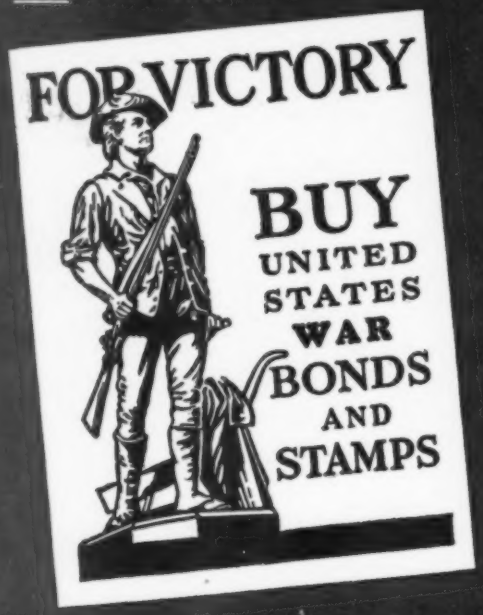
New York.3390-165 Broadway Bldg.
Cleveland.....2262 Guildhall Bldg.
Havana.....402 Edificio Abreu
Birmingham..1586 North 50th Street
Tulsa.....1646 Hunt Bldg.
Houston.....5615 Clinton Drive
Philadelphia...1644-1700 Walnut St.
Washington.....330 Bowen Bldg.
San Francisco.....1083 Rialto Bldg.
Greenville.....York Street

Plants at BIRMINGHAM, CHICAGO, and GREENVILLE, PA. In Canada: HORTON STEEL WORKS, LIMITED, FORT ERIE, ONT.

"Remember, Our Boys Give Their Lives . . .
You Lend Your Money!"



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Suppliers of
LIQUID
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To the War Front!

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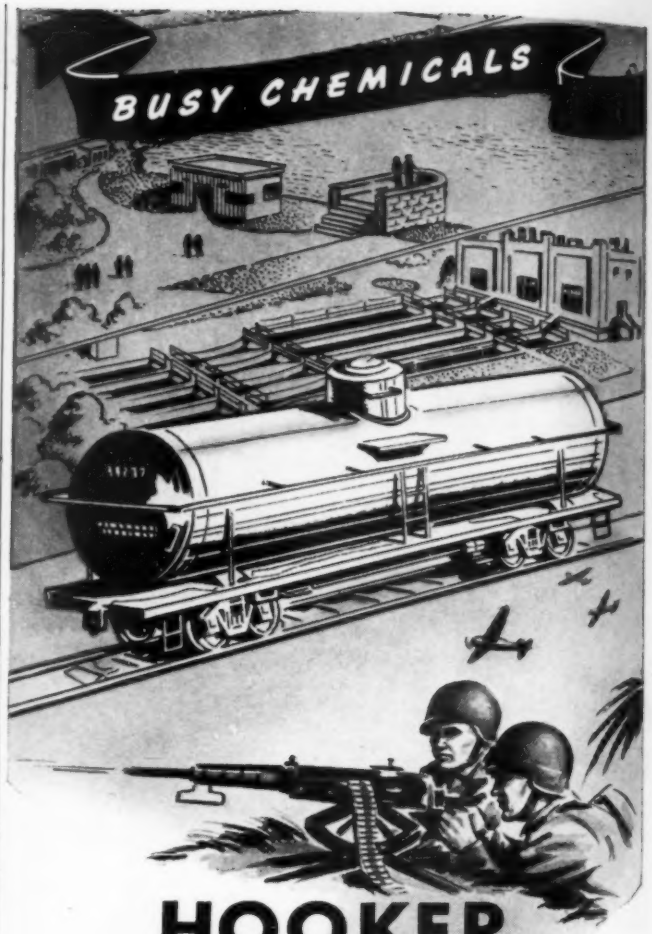


HOOKER

FERRIC CHLORIDE SOLUTION

The same Ferric Chloride Solution you use in sewage treatment to guard public health at home also goes to war. Its use helps produce dyes for uniforms and other textile products used ashore, afloat and aloft. Naturally these and other war-uses piled on top of civilian requirements, have stepped up the demand. HOOKER regularly meets capacity-straining orders without relaxing its quality standards. HOOKER Ferric Chloride solution regularly and unfailingly can be relied upon to give you 40% to 50% $FeCl_3$ and not over 0.2% $FeCl_2$.

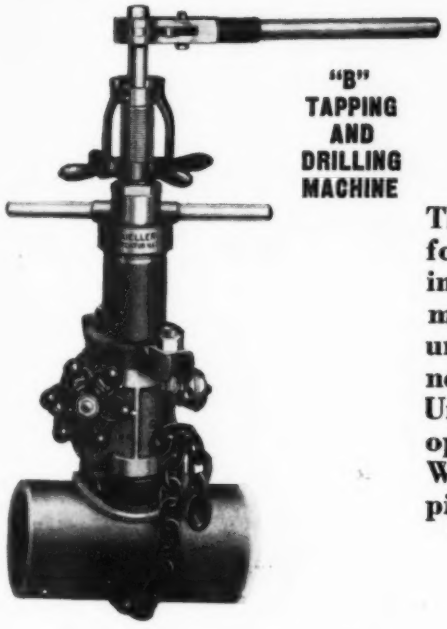
The same high quality-standards apply to other HOOKER Chemicals for the waterworks and sewerage field — Bleaching Powder, Caustic Soda, and Liquid Chlorine.

ARMY E NAVY
HOOKER ELECTRO CHEMICAL COMPANY

HOOKER ELECTROCHEMICAL COMPANY
Niagara Falls, N. Y.
New York, N. Y. Tacoma, Wash.
Wilmington, Calif.

HOOKER CHEMICALS

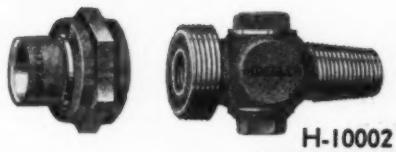
A "COMMANDO" FOR ENDURANCE



"B" TAPPING AND DRILLING MACHINE

Hats off to the American Rangers—our own commandos who are ready to strike at any hour day or night, ask no odds, give no quarter, and do such an effective job!

The MUELLER "B" Machine is a regular "commando" in performance, too! It can take the roughest treatment, works well in close quarters—operating at any angle anywhere on the main, is ready day or night to make connections to dry mains or under pressure,—effectively doing a better job. Here is a tool needed by anyone who works with water, gas, or oil lines. Uniquely designed, it does the work needed with the simplest of operations and with but a few tools. This cuts costs, of course! Will drill and tap pipe, and insert or remove corporation stops, pipe plugs, etc.



H-10002 CORPORATION STOP

The MUELLER Corporation Stop is a fit partner for the "B" machine. Carefully designed, well made, and rigidly tested—it works perfectly in this machine. Once installed it is ready to give years of service. Because of these factors MUELLER Stops are used by 85% of all the water works in America—proof enough of their dependability.

MUELLER CO. ★ DECATUR, ILL.

YOUR GOVERNMENT NEEDS MONEY. KEEP ON BUYING WAR BONDS!

Dedicated to a Great Task That Lies Before Us

WORLD'S LARGEST ACTIVATED SLUDGE PLANT, Southwest Sewage Treatment Works, Sanitary District of Chicago, is equipped with Link-Belt Straightline sludge collectors for primary and concentration tanks; straightline mechanically-cleaned bar screens; mixers, screw conveyors, and belt conveyors for handling filter cake; water intake screens; coal handling conveyors, as well as power transmission equipment, such as variable speed transmissions, speed reducers, gears, bearings, etc.

LINK-BELT looks ahead with engineers who plan for better sanitation

● Link-Belt, a company that has developed mechanical equipment for many of the world's most efficient sewage and water treatment plants, now looks ahead to the great task of keeping America the cleanest, healthiest country in a world at peace. The post-war planning of every community should and will include facilities for the proper handling of its sewage and industrial wastes.

With a history of outstanding achievements in the development and manufacture of mechanical handling, screening, aeration and mixing equipment, we offer our experience and facilities to the engineers and operators of America's sewage and water treatment plants in the accomplishment of the great task that lies before them.

LINK-BELT COMPANY

Specialists in the Manufacture of Equipment for Water and Sewage Treatment Plants

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9125

LINK-BELT

SCREENS · COLLECTORS · AERATORS · GRIT CHAMBERS · MIXERS

Another *Uproar* in the East End!

SUPERINTENDENT:
"About 10 more calls from the East End this morning, Joe. You'll have to flush those hydrants again."

FOREMAN:
"Why I just flushed 'em two weeks ago! How much longer does this keep up?"

IT needn't keep up any longer, Joe. Most corrosion headaches in municipal water systems can be eliminated. A few parts per million of Calgon added at the pumping station will *reduce* corrosion to such an extent that "red water" ceases to be a serious problem.

Cities using Calgon treatment not only reduce complaints but protect their own pipelines and those of their customers as well. This is tremendously important now since water pipe and tanks may become difficult to replace.

In Calgon, water companies have at their disposal a tool that will prolong the life of iron and steel water pipe and water-using equipment for the entire community. This treatment already has been successful in hundreds of American cities.

These advantages can be obtained at surprisingly low cost—for only 0.5 to 10 ppm. of Calgon* are needed for the treatment. Write today for complete data and technical information on Calgon treatment.

Calgon solves 4 water works problems

1. **Prevention of scale** from hard, high-bicarbonate waters. Calgon, added at the plant, prevents scale formation in mains, meters and hot-water heaters, throughout the system.

2. **Corrosion control**—Calgon forms a thin protective film on metals and metal oxides at pH values of 5.0 and higher. This reduces the attack of oxygen to such an extent that corrosion ceases to be a problem.

3. **Prevention of "red water"** — Calgon prevents the precipitation of dissolved iron. Thus "red water," either from iron initially present in well water, or from corrosion, can be eliminated.

4. **Stabilization of water** following lime or lime-soda softening. Calgon's ability to prevent precipitation of calcium carbonate stabilizes water to the ends of the system.

Calgon is the registered trade-mark of Calgon, Inc., for its sodium phosphate products.

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HALL
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calgon, inc.

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HAGAN BUILDING
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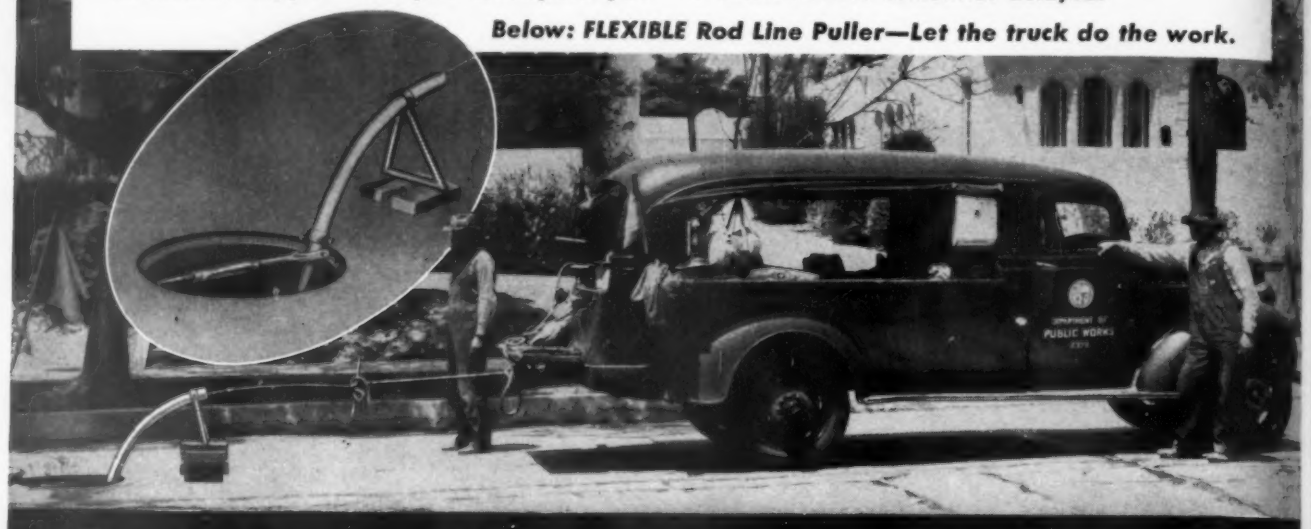
BE SAFE — ORDER YOUR "FLEXIBLE" TOOLS EARLY!

Though we are getting good priorities for materials used in manufacturing FLEXIBLE tools, labor shortage in our factory has built up a considerable backlog of unfilled orders. We, therefore, suggest that you anticipate your requirements for all types of FLEXIBLE pipe-cleaning tools as far ahead as possible. All orders on hand are being filled as promptly as possible and we must ask you to bear with us if deliveries are somewhat delayed.

Below: FLEXIBLE Rod Line Puller—Let the truck do the work.



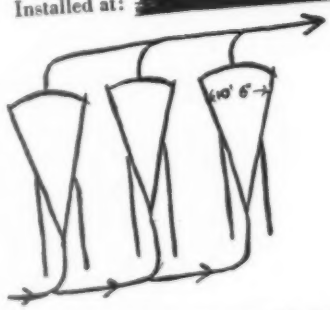
FLEXIBLE SEWER-ROD EQUIPMENT CO.

9059 VENICE BOULEVARD, LOS ANGELES, CALIFORNIA
401 BROADWAY, NEW YORK, N. Y. • PICKWICK BLDG., KANSAS CITY, MO.

FIELD REPORT

THE PERMUTIT COMPANY, NEW YORK, N. Y.

Equipment: "SPIRACTOR" COLD LIME WATER SOFTENER
Installed at: _____



Note small area for daily capacity of 3,000,000 gallons!

This plant has more than met specifications. Detention time is only 8 minutes. There is no sludge. Softened effluent is so clear that filters have little to do. Engineer much pleased at fine results and simplicity. Simply turned on the water and the chemicals — no time wasted in getting started.

WATER ANALYSIS	RAW WATER	SPIRACTOR EFFLUENT*
Total Hardness	180	40
Calcium Hardness	172	32
Alkalinity A (Methyl Orange)	180	40
Alkalinity B (Phenolphthalein)	0	20
Free Carbon Dioxide	20	0

*Before filter

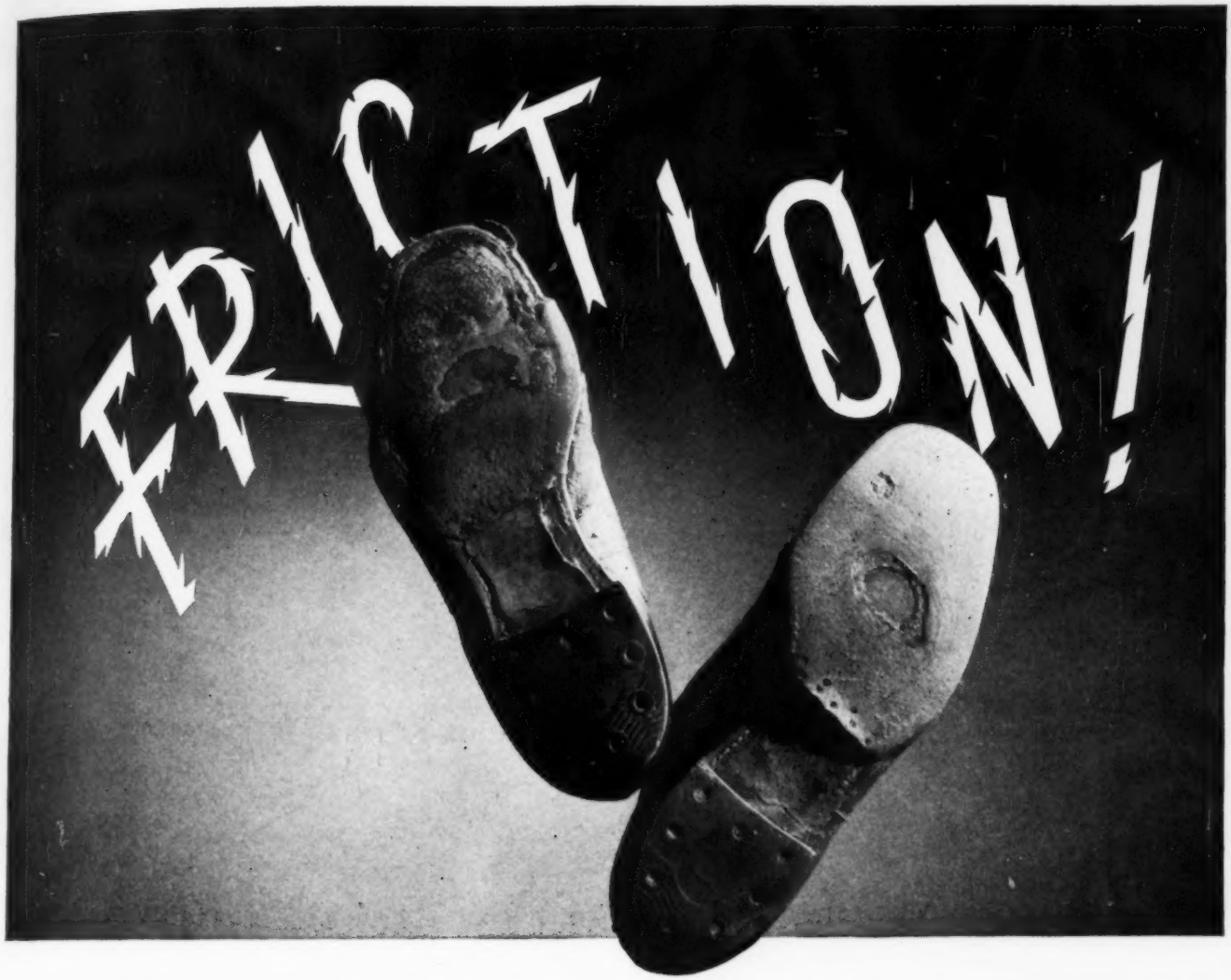
SOFT, CLEAR WATER IN 8 MINUTES BY NEW SPACE-SAVING METHOD

•

Write for free bulletin to The Permutit Co., Dept. G1, 330 West 42nd St., New York, N. Y.
In Canada: Permutit Company of Canada, Ltd. Montreal . . . Toronto . . . Winnipeg . . . Calgary.

PERMUTIT

WATER CONDITIONING HEADQUARTERS



REDUCE WEAR AND REMOVE CARBON WITH MACMILLAN RING-FREE MOTOR OIL

Undue motor wear, waste of fuel and excessive carbon have no place in a sound preventive maintenance program. At the same time, "production" must be speeded up. That's why operators simply must pay more than usual attention to motor lubrication ... and motor *cleanliness.*

Macmillan RING-FREE Motor Oil cuts down waste and wear while speeding up performance, and at the same time, RING-FREE removes carbon!

In 1094 Certified Road Tests, with various makes of owner-driven cars, 10 per cent increases in gasoline mileage were not uncommon after crankcases were drained and refilled with RING-FREE. As indicated by these tests, the average immediate saving was 1.3 miles per gallon! These tests emphasize that RING-FREE lubricates better ... *reduces friction faster.* It delivers direct to the drive shaft more of the horsepower ordinarily wasted in overcoming motor friction. It postpones "down-time" for repairs.

Macmillan RING-FREE Motor Oil combines all these qualities: great film strength, high heat resistance, long cling to metal, fast penetration ... *plus* the fact that it is non-corrosive, is less affected by dilution and it *removes carbon.*

CARBON REMOVAL A NATURAL RING-FREE FUNCTION

Macmillan RING-FREE Motor Oil actually removes carbon while the motor runs! Hence, by its continued use, pistons, rings, valves—all vital parts—stay cleaner. Carbon removal is a natural function of RING-FREE, inherent in the crude oil and retained by the exclusive Macmillan patented refining process, *without the use of additives.*

TO SUM UP: MACMILLAN RING-FREE gives more horsepower to the drive shaft—tangible saving of fuel—allows less wear on hard-to-replace engine parts—it removes carbon.

Macmillan Petroleum Corporation

50 W. 50th St., New York • 624 S. Michigan Ave., Chicago • 530 W. Sixth St., Los Angeles

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Macmillan Petroleum Corp.

MACMILLAN RING-FREE MOTOR OIL

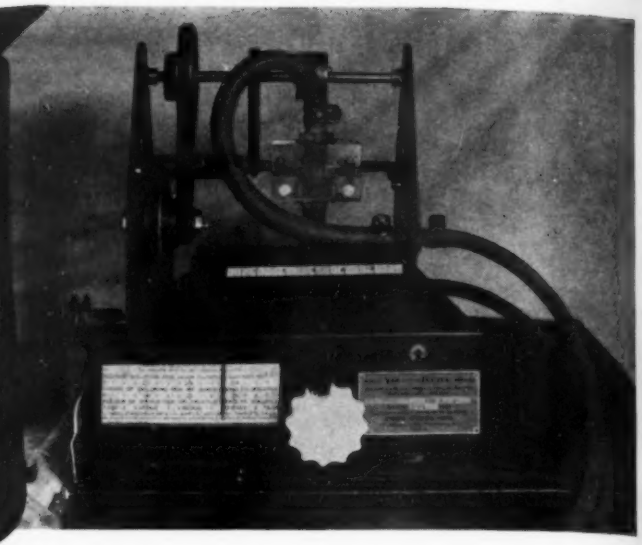
REDUCES WEAR BY REDUCING FRICTION

Automotive Engineering Applied to Chemical Feeders

RESULT:

VAR-I-FEEDER

The Most Compact, Conveniently Operated, Low Cost Portable Chemical Feeder . . .



Var-I-Feeder removed from case. Note small compact size, accessibility for repairs and adjustments, finger-tip dial control, illuminated instrument type panel, visible illuminated reagent head, streamlined through-flow, and external pulley for belt connection to gasoline engine or available R.P.M. if current for motor drive (1/20 H.P.) is not available.

★ ★ ★

AUTOMOTIVE ENGINEERS reduced the weight and cost of motor cars and increased their efficiency by designing HIGH-SPEED engines. Chem-Feeds, Inc., a new company formed by PIONEERS in proportioning, has applied the same principle in designing Var-I-Feeder, a sensational new portable apparatus for water main sterilization, for military use, or for all chemical treatment.

This apparatus pumps over 200 "shots" per minute as compared with the conventional 10 to 40 "injections", thus approximating a continuous stream. It is as convenient to carry as an overnight suitcase and stacks readily, one atop another, in storage.

While it costs less to buy and to maintain than conventional feeders, it sacrifices nothing in efficiency or durability. On the contrary, it offers many startling improvements in design. For instance, it has finger-tip control of speed and feed while operating. As simple as tuning in your radio.

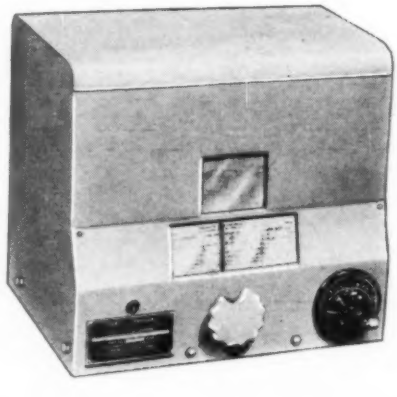
Where portable emergency main sterilizers, hypochlorinators, or other easily transported chemical feeders are in demand, Var-I-Feeder is the "watchword".

Our new circular gives many more details. Write for it.

JEFF CORYDON, *President*

CHEM-FEEDS, INC.

77 RESERVOIR AVE., PROVIDENCE, R. I.



A permanent type of casing for indoor installations. Timer dial at right of panel is for attachment to water meters for proportional control.

ILLUSTRATING EXTREME PORTABILITY

VAR-I-FEEDER IN OPERATION

WATER WORKS & SEWERAGE

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330 South Wells Street, Chicago, Ill.
E. S. Gillette, Publisher

EDITORIAL OFFICE
155 East 44th Street, New York, N. Y.
L. H. Enslow, Editor

COMING!

Rejuvenating an Old Filter Plant
Under wartime conditions and circumstances is an interesting story, revealing what can be done in the direction of renovating equipment already having seen long service in one of America's very first filtration plants. Of particular interest are the metal surface preparation schemes of sand-blast and the relatively new "Flame Priming" scheme of spontaneous dehydration of rust and tubercules with an acetylene torch for metal surface preparation.
The author is
PAUL WEIR, Asst. General Manager,
Atlanta, Ga., Water Works.

"The Economics of Air-Diffuser Cleaning"
Is a description of the Cleveland method and equipment developed for cleaning air diffuser plates at the Easterly Activated Sludge Plant. The power economy resulting, and net benefits derived are set forth to give a picture of the dollar and cents side of effective diffuser media maintenance. The author is—
JOHN J. WIRTS, Supt.,
Easterly Treatment Works, Cleveland, Ohio.

"Main Rejuvenation With 'Victoree' Lining"
Tells of experiences with cleaning and cement lining in place of trouble giving mains in the system—those dead ended mains. His story constitutes a most convincing argument of the value of this scheme of putting an end to consumer complaints of rusty water and the solution of the question of fire supply pressures without main replacement at double to triple the cost. His argument is that now is the time of times to undertake rejuvenation of existing mains with noncritical cement linings, placed with a minimum of manpower.
This story is by
ROGER ESTY, Superintendent,
Water and Sewer Board, Danvers, Mass.

"Digestion Tank Heating—Theory and Practice"
Is a veritable treatise by a contributor whose articles are known to readers of "Water Works and Sewerage" for the study behind them and their exhaustive quality. The author is—
N. C. WITTWER, Consulting Engineer,
Trenton, N. J.
(Former Supt. Rahway Valley Plant and now Captain, U. S. Engineers.)

"Dependability of Double Check Valve Installations"
In response to a number of requests in recent months asking for advice as to the relative merits and dependability of approved Factory Mutual type double check valve installations between public and private fire protection systems, the forthcoming article has been prepared at our request. It represents the best record available of the extent to which approved double checks constitute dependable protection to public water supply against private fire service back flow into the mains. The author is—
F. O. A. ALMQUIST, Senior Eng'r,
State Dept. of Health, Hartford, Conn.

"Sludge Bulking Control"
Is a recital of experience with mild chlorination of returned sludge, during a number of summers, for the purpose of controlling sludge bulking. The author is—
E. E. SMITH, Supt. of Water and Sewage,
Lima, Ohio.

"The Control of Corrosion"
Is a well rounded out article on a topic of which it is impossible to know too much and concerning which there seems that much is still to be learned. We are privileged to offer this discussion of corrosion and its control in water supply practice by one who has probably a longer contact with the corrosion problem than any other water supply engineer. He is our water treatment patriarch—
ROBERT SPURR WESTON,
Consulting Engineer, Boston, Mass.

"The Slough Flo-Meter"
Is the invention of a plant superintendent of a simplified flow-meter for water and sewage plants. The author and inventor—
JOHN D. SLOUGH, Superintendent,
Water Works and Sewerage, Wellsville, N. Y.

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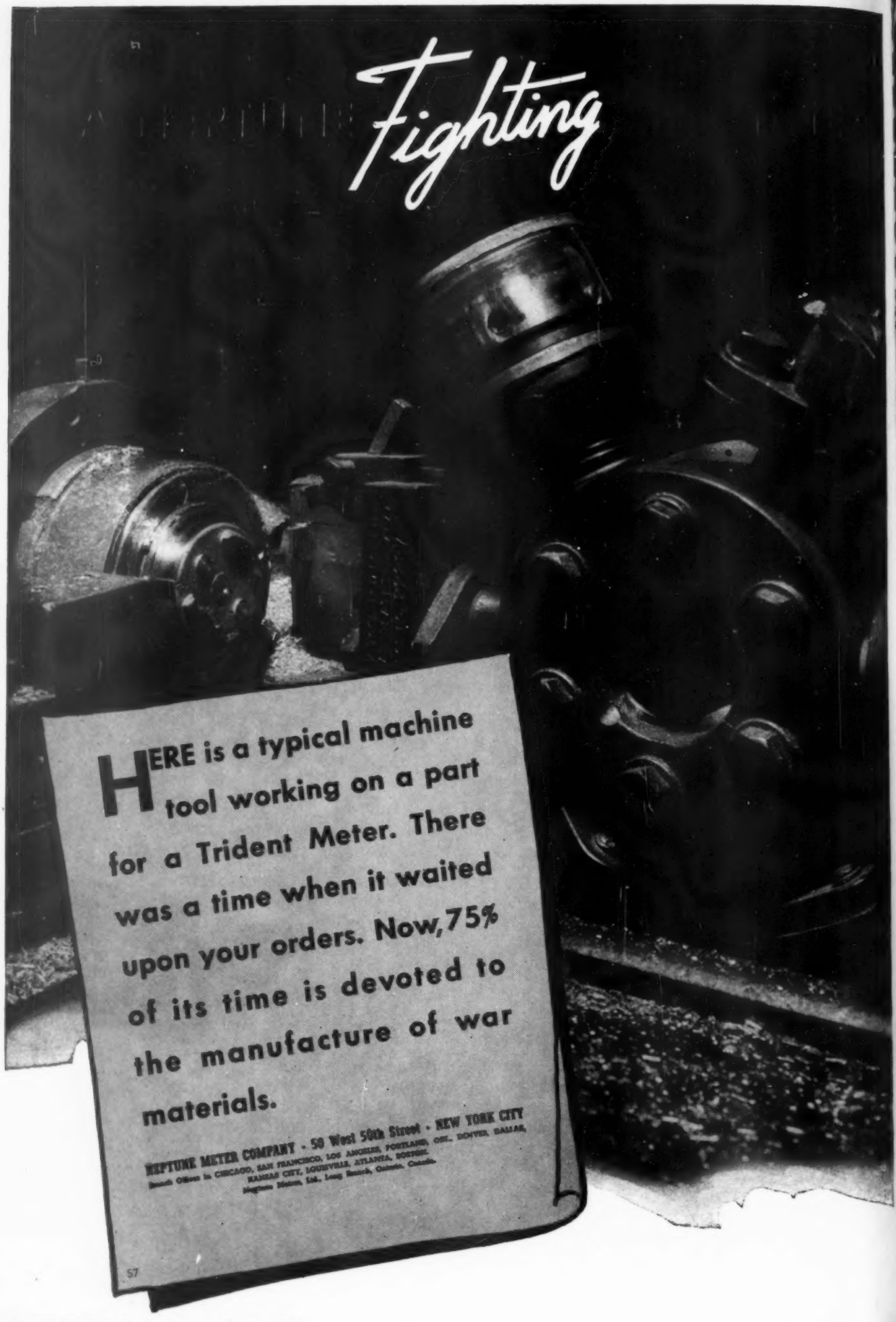
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WATER WORKS & SEWERAGE

VOL. 90, No. 5 *A Gillette Publication* MAY, 1943

THE NEW WATER SUPPLY OF BECKLEY, WEST VIRGINIA

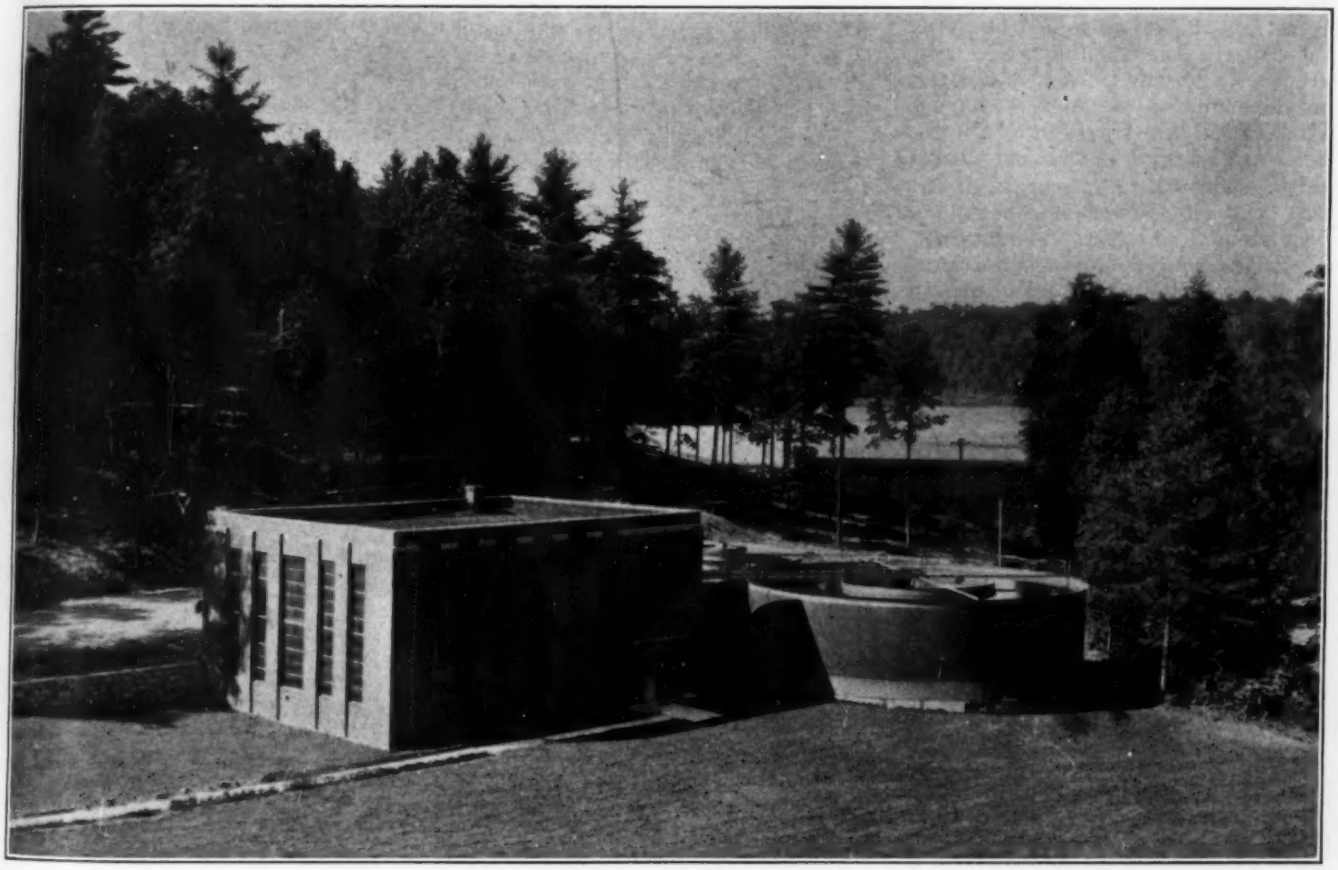
By W. D. KELLEY
Consulting Engineer
CHARLESTON, W. VA.

IN the Allegheny Mountains of southern West Virginia, half a mile above sea level, is situated the small but rapidly growing town of Beckley. This community, in the heart of the rich bituminous coal fields has had a remarkable growth since the turn of the century. Of the several hundred inhabitants in this territory in 1900, many have lived to see the incorporated town of Beckley reach a population of 12,860 (census 1940) and to witness the birth and growth of contiguous towns and coal camps totaling a population greater than the parent city.

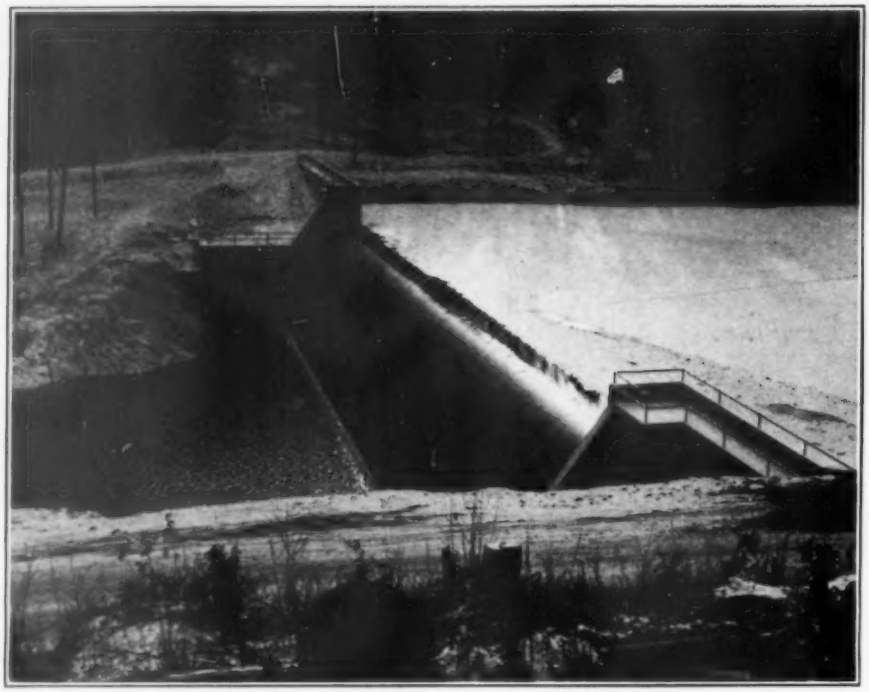
The Author

The Beckley Water Company began furnishing water service to the community in 1907. From the beginning, this company has been troubled with "growing pains" due to the constant increase in demands upon their water system. From a modest beginning of less than one hundred consumers in 1910, they have expanded yearly until they now serve directly or indirectly over six thousand consumers.

Prior to 1940, the chief source of water supply for this community came from the mining operations in the territory. This water was treated and pumped through two pressure filters into the 98 miles of distribution system mains. By 1940 it became apparent that this source alone would not continue to be sufficient to adequately serve the community, and since the water had the objectionable features of extreme hardness and



General View of the New Filter Plant of the Beckley Water Co., Beckley, W. Va.
Through the Trees May Be Seen the Dam and Lake.



Concrete Dam Overflowing from Ice Covered Pool
(*Spillway Elevation* 2670 *Ft.—Storage* 400,000,000 *Gals.*)

acidity, it was decided to develop an entirely new source of water supply.

New Source of Supply

After extensive investigation and economic studies of all possible sources of supply, a site on Glade Creek about ten miles southeast of the city was selected and twelve hundred acres of land purchased for the development of a surface supply. Glade Creek, a trout stream with head-waters high in the mountains (elev. 3500), is a stream of clear, cool and soft water that flows the year round. The 25 square miles of drainage area does not, however, furnish sufficient flow at all times to meet the requirements of Beckley, and so to provide storage for such periods an impounding reservoir was necessary.

Dam and Reservoir

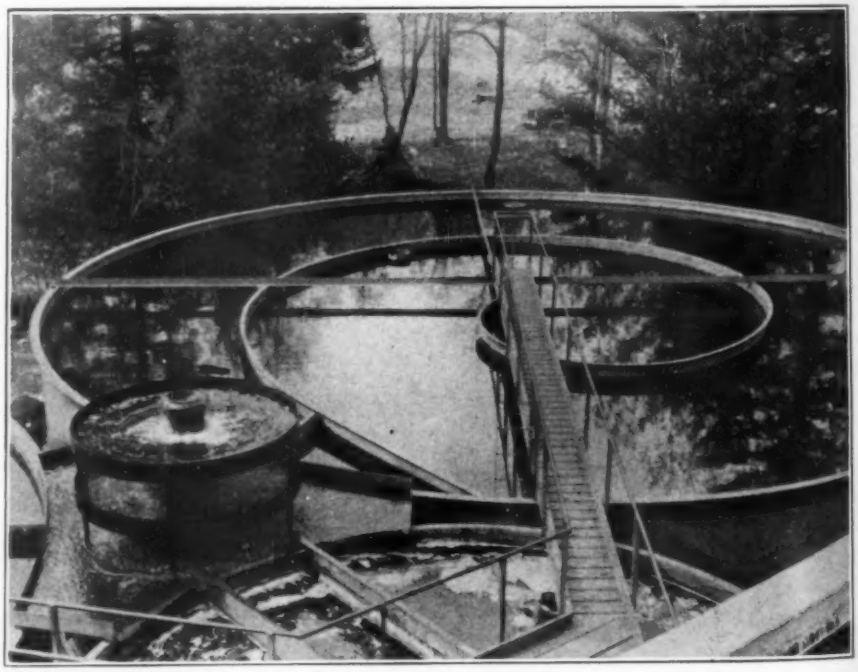
A gravity type concrete dam to impound 400,000,000 gallons was built with a spillway thirty feet above the stream bed, and a total length of four hundred feet at the crest. At normal pool (Elev. 2670), one hundred seventeen acres are inundated by the lake and this required the clearing of one hundred thirty acres of heavily wooded land. State Highway No. 3, which crosses the upper reaches of the lake, had to be relocated and raised above the pool stage for a distance of 6,000 feet. The spillway section of the dam was built with a clear opening of 220 feet to maintain a low overflow head even at times of high stream flow, which generally follows the spring thaw in the snow-covered mountains. Built on a foundation of sandstone rock, the concrete structure has a vertical face on the upstream side of both the spillway and bulkhead sections. The spillway is formed with an ogee section, having an effective width of eight feet at the crest and a seven on ten slope on the downstream face. (See cut.) Erosion below the spillway is controlled by a concave spillway apron and a stilling weir approximately two hundred feet downstream from the main dam, which maintains a pool to "cushion" the fall of water. The bulkhead sections, with a width of five and one-half feet at pool elevation, have a seven on ten slope on the downstream face below this elevation and extend ten feet above pool where the width is five feet. Protected by handrail, this forms a walkway to the observation platform on the west end of the dam, and on the east end to the valve operating platform over the intake chamber and sluiceway which are built into the concrete structure. Piping and port openings are arranged to permit water to be drawn from the reservoir at four different elevations.

Purification Plant and Pumping Station

Approximately six hundred feet downstream from the dam is located the new filtration plant and pumping station, consisting of a two story brick and tile building 44 feet by 56 feet in plan, housing the filters, chemical equipment, chemical storage, laboratory and pumping equipment. Two sedimentation basins (tanks) are constructed in the open at the west end of the building, and the mixing chamber and aerator are nestled in between the building and the sedimentation tanks.

Aerator and Mixing Chamber

Water normally flows by gravity from the dam through a sixteen inch pipe line to the mixing chamber. This unit is a welded steel tank twenty-three feet in diameter and



One of the Twin Spiral Baffled All-Steel Clarification Tanks, with Tray Aerator and Mechanical Mixing and Flocculation Tank in Foreground

Operating Floor and the Four All-Steel Filters, Each with 500,000 G.P.D. Capacity.
These Units Have Since Been Equipped with Palmer Filter Bed Agitators.

fourteen and one-half feet deep. It is equipped with agitator blades powered by electric motor through variable speed drive. Low lift pumping equipment is provided for operation when the drawn-down in the reservoir is sufficient to prevent gravity flow.

The aerator is simple in construction, but effective in results. It consists of a main sixteen inch diameter vertical pipe and two steel trays eight feet in diameter welded to short sections of sixteen inch steel pipe. Each tray has approximately 7,000 holes of three-sixteenths inch diameter. The sectional construction will allow for the removal of existing trays or installation of additional trays if required.

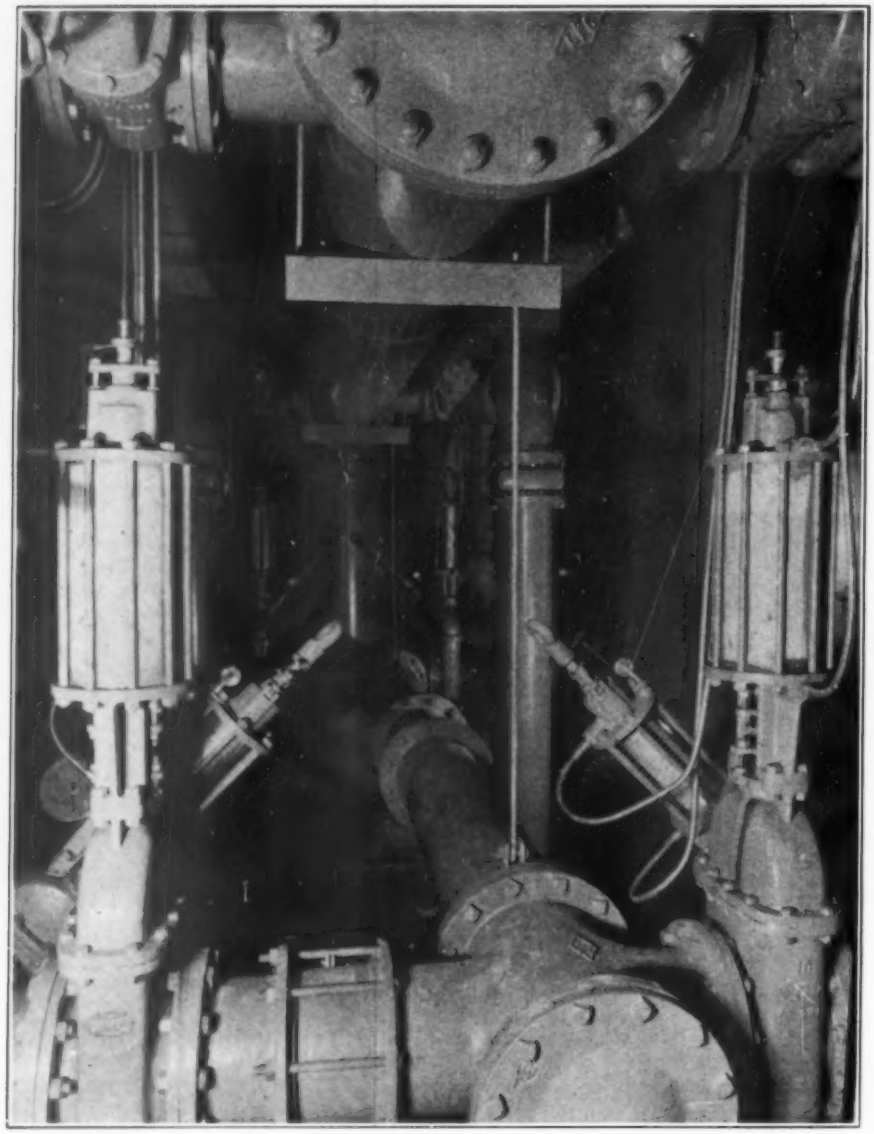
Sedimentation Basins

The two sedimentation basins are welded steel tanks fifty-six feet in diameter by fourteen and one-half feet high, with spiral baffles. A vertical perforated plate extending from the main tank wall to the spiral baffle, at a point approximately ten feet distant from their intersection, serves as a diffuser baffle. Into the triangular area thus formed, the flocculated water flows by gravity from the mixing chamber through underground piping. The capacity of the two sedimentation tanks is 500,000 gallons, which will permit a four-hour retention period when operated at the ultimate design rate of 3,000,000 gallons per day. Settled water is drawn off through a vertical pipe near the center of the tank, the end of the pipe being normally submerged 24 inches. A twelve-inch overflow line, twelve-inch plug valve at center of tank, and a special twenty-inch flanged bottom outlet (for sludge removal) complete the sedimentation tanks.

The Filters

The four filter units, each having a capacity of one-half million gallons daily, are located in the east end of the brick and tile building where the two story height is unbroken except for the operating platform. These units, also of welded steel construction, are fifteen feet in diameter and fourteen and one-half feet high, and in addition to accommodating the filter beds, provide some clear water storage in the lower section. A horizontal division plate, built into the tank, separates the filter unit from the clear water compartment. The upper nine feet of the tank serves as the filter, and the bottom five and one-half feet as the individual clear well for each filter. Immediately above the division plate is another horizontal plate forming a false bottom. The upper plate is built in removable sections and tapped for ⅝-inch brass umbrella type strainer nozzles, of which there are 692 on 6-inch centers in each filter. The area between these plates form the collecting system from whence the filtered water is piped outside the tank to the effluent valve and the rate of flow controller, and is then piped back into the clear well section of the tank.

The filters are of the rapid sand type, with eighteen inches of gravel and thirty inches of sand. The steel wash troughs in each filter have leveling strips of cypress wood. Control valves are hydraulically operated from the tables on the operating platform with the conventional influent, effluent, waste, wash and rewash valves. Each filter is equipped with rate of flow controller and loss of head gauge. Wash water from the transmission main is gauged and metered by an indicating and totalizing meter on the operating platform.



Portion of Compact Pipe Gallery Between the Steel Filters

A tile lined sight well is also provided on the operating platform for visual inspection of finished water. The four filter units now installed have a total capacity of two million gallons daily, with provisions for the addition of two more units to increase the daily capacity to three million gallons when required.

Chemical Equipment

Double doors on the filter operating platform offer clear passage to the Chemical Equipment Room. A door at the west end of this room, together with walkways outside, permits easy access to the top of the mixing chamber and sedimentation tanks. Four dry feed chemical machines are provided, discharging into an open trough that extends through the wall to the mixing chamber only a few feet outside the building. A dust tight compartment is built over the hoppers to serve as a dust-trap. The machines are charged from a platform in the adjoining chemical storage room through an opening in the tile wall. Opposite the dry feeders are located the chlorinators and ammoniator.

Laboratory

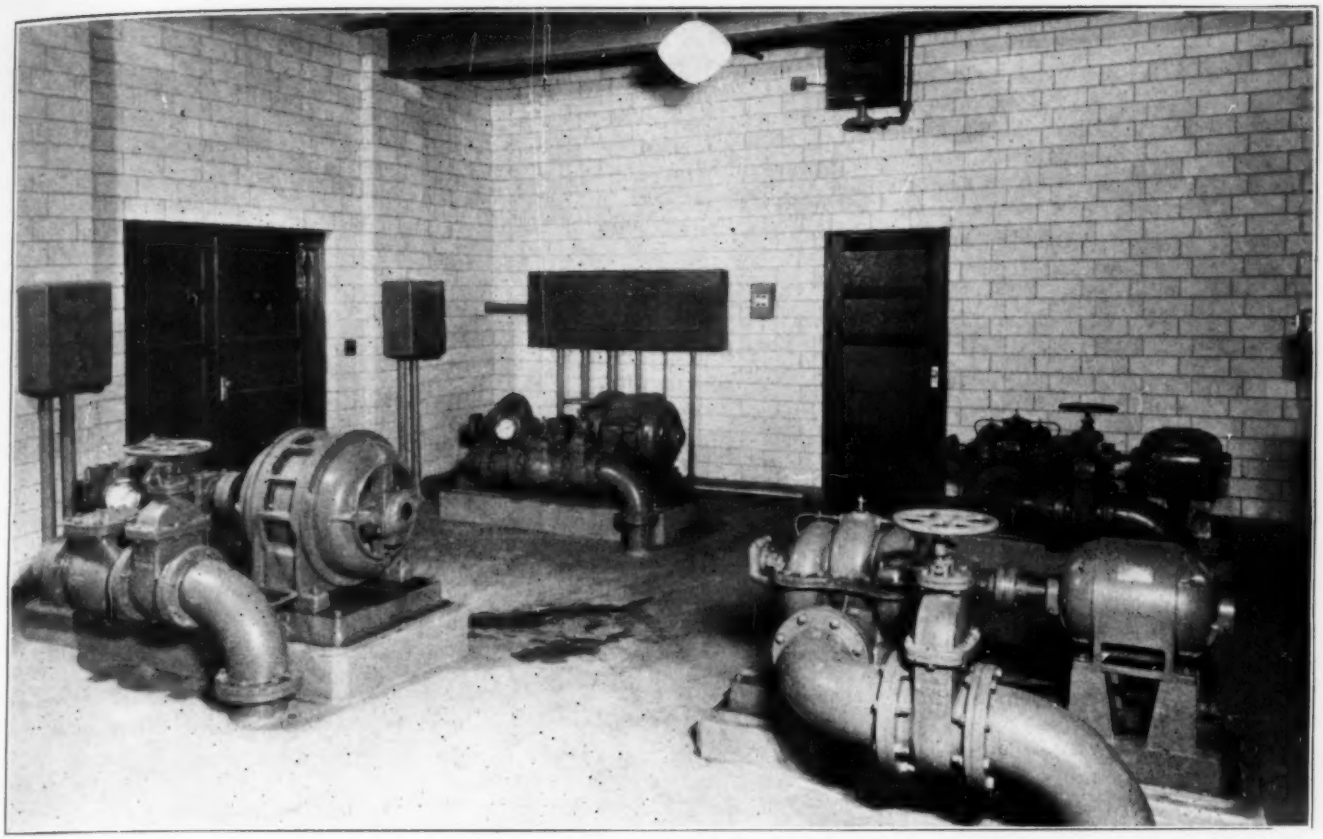
A modern, compact, and well equipped laboratory is also located on the second floor in the northwest corner of the building. Along the west wall of this room is built the acid-proof sink and stone table top over the built-in cabinets. On the opposite side of the room are located the electric stove, refrigerator, incubator and operator's desk with pressure recording gauge and indicating, recording and totalizing meter gauge mounted on the wall. The meter proper as well as the tap for recording gauge are located on the pump discharge main just outside the building.

Pumping Equipment

The pump room is located on the ground floor (elev. 2655) and the equipment consists of two low service motor driven centrifugal pumps of 1,050 and 1,400 gallons per minute capacity and two high service pumps of the same capacity. The low service pumps take suction out of the raw water line from the reservoir and discharge either to the aerator or to the mixing chamber direct, as conditions warrant. The high service pumps take suction out of the clear wells and since the bottom of the clear well is at the same elevation as the pump room floor, the pump suction is generally under a positive head. Under normal operation, the total loss of head in the purification process from the aerator to the pump suction is 14 feet, and when aeration is not required, this loss is reduced to ten feet. A float switch operating from the clear well protects the high service pumping equipment against loss of suction. Space and piping arrangement will permit the installation of additional pumping equipment when needed. The pipe gallery through the double doors in the pump room and the furnace room, shower and locker room through the single door, complete the ground floor level.

New Storage Tank

Located on a ridge 165 feet above and 4600 linear feet distant from the pump room is the new welded steel tank 84 feet in diameter by 25 feet high, having a capacity of 1,000,000 gallons. This tank is 205 feet higher in elevation than the existing distribution tanks in Beckley (elev. 2615) of which there are two 1,000,000 gallon steel tanks and one 335,000 gallon elevated steel tank. Water from the high service pump discharge is transported through a sixteen inch main to the new tank, from whence it flows by gravity through ten miles of fourteen inch main to the point of junction with the existing distribution system. This tank, while of sufficient capacity to afford additional storage of filtered water, was primarily installed as an operating expediency. Considerable territory was opened to water service by the new supply mains, and to serve this territory as well as for public health protection, the tank was installed to maintain pressure on the mains at all times. With a full tank at the supply end of the fourteen inch gravity line, it is also possible to shut down the filter plant for pe-



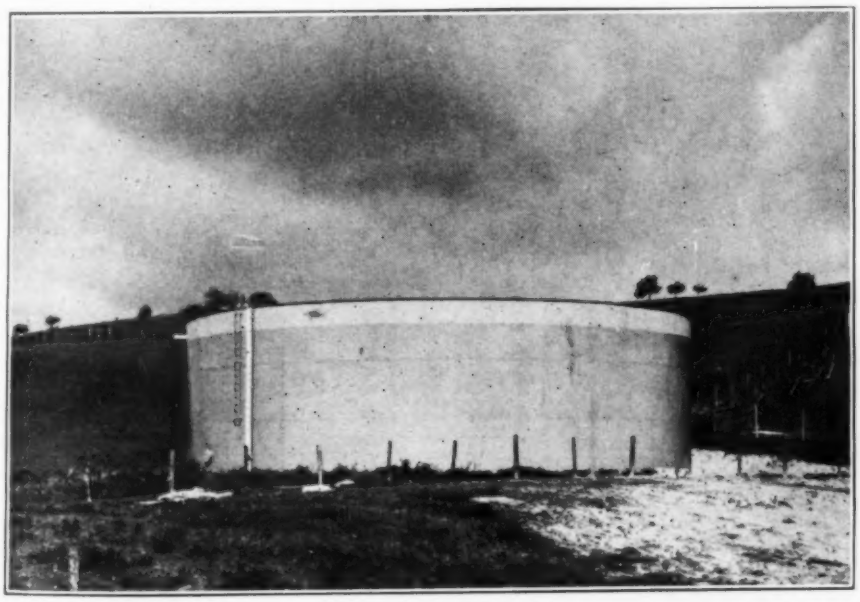
Pump Room

Low Service Pumps on Right; High Service Pumps on Left. The Double Doors Open into the Pipe Gallery; Single Door to Locker and Furnace Room. Floor Elev.—2655.

riods of from six to twelve hours, depending upon the rate of consumption at the time.

Semi-Automatic Rate of Flow Control

Control of the rate of flow in the gravity supply main was necessary to prevent overflow of the existing distribution system tanks. Installation of float valves in these tanks was precluded by the excessive pressure that might develop in a closed distribution system by reason of the higher elevation of the gravity supply tank. To limit the maximum pressure in the system and to serve somewhat as a rate of flow controller, a pressure regulating valve was installed in the supply main at a point where static head from the supply tank is 245 feet and from the distribution tanks 40 feet. By increasing the discharge pressure of the regulator above the static head a flow is created and the rate of flow is governed by the amount of the increase. The regulator maintaining a uniform head on the low pressure side, creates a condition of increasing the effective head for water flow as the static head reduces with a drop in water level in the distribution tanks. Under these conditions, the rate of flow increases as the water level in the distribution tanks falls and decreases as the tanks fill. This installation automatically controls the water level in the tanks within a range of about five feet for relatively long periods, but it is occasionally necessary to change the regulator pressure to meet seasonal demands. This installation could not be satisfactorily used except where the daily and weekly *peak* demands are relatively light as is the case in Beckley.



Clear Water Reservoir

84 ft. diam. and 25 ft. deep; holds 1,000,000 gals. From the Filter Plant the finished water is pumped into this "clear water well" from which it flows by gravity into Beckley. Flow from this tank is automatically regulated to maintain maximum elevation of water in the elevated tank and standpipes in the distribution system.

Supply Mains of Steel Pipe

Approximately eleven miles of pipe line were constructed as follows:

600 ft. 16 inch Raw Water Main —Dam to filtration plant.

4600 ft. 16 inch Pump Discharge Main—Filtration plant to steel tank.

52,400 ft. 14 inch Gravity Main—Steel tank to city.

Pipe used for this construction was black seamless steel pipe of fourteen inch and sixteen inch outside diameter having a wall thickness of one-fourth inch and a test pressure of 600 pounds per square inch. Spun enamel lining 3/32 inch thick applied at the mill protects the interior of the pipe against corrosion, and the exterior of the pipe is protected by material of the same specification and thickness, reinforced by an asbestos felt shield and a wrapping of kraft paper. The pipe and protective coating were furnished in accordance with the A.W.W.A. Specification 7A-4 and 7A-6 with Label Service Inspection by the Underwriters Laboratories, Inc. Plain end pipe was furnished with the outside protective coating cut back at each end for assembly with flexible couplings. In general, the pipe was of double random length, with a small percentage of random length pipe used where required by the trench alignment. Fittings were shop fabricated from steel pipe and also received the protective coatings before delivery. Flexible couplings, as well as the exposed end sections of the pipe were given a heavy application of coal tar enamel in the field after assembly. Valves were ordered with plain ends in O.D. pipe sizes for similar installation.

Practically the entire pipe line was laid parallel to the roadway, and inside the right of way of the State and County roads and City streets. Under these conditions, the pipe trench was backfilled immediately after installation of pipe and fittings. Tests were conducted at the completion of the job under a specification limiting the leakage on a per inch of diameter, per mile of length basis. Remarkable as it may seem, this pipe line, with more than 1500 joints, showed absolutely no pressure loss under test at 100 pounds above the working pressure.

Costs

The estimated cost of this project was $552,000.00 and the actual construction costs, including engineering and overheads were about 10% under this figure:

CONSTRUCTION COSTS

Land (1200 Acres)	$ 27,300.00
State Road Relocation, 6000 lf.	25,000.00
Clearing, Fencing, Landscaping, etc.	28,300.00
Concrete Dam and Auxiliary Structures	128,100.00
Brick and Tile Filter Building	26,700.00
Pumping Equipment	6,000.00
Purification Equipment	54,800.00
Steel Tank, 1,000,000 gallon capacity	14,200.00
Supply Mains, 5200 lf. 16 inch	18,000.00
Supply Mains, 54,200 lf. 14 inch	169,600.00
Total Construction Costs	$498,000.00

Principal contractors and vendors participating in this work were as follows:

Concrete Dam—C. C. Dodd Construction Co.
Filter Building — Pittsburg Des Moines Steel Co.
Purification System — Pittsburg Des Moines Steel Co.
Steel Tanks—Pittsburg Des Moines Steel Co.
Pipe Trenching—Vecillio and Grogan.
Steel Pipe—National Tube Co.
Pipe Lining and Coating—Hill Hubbell Co.
Flexible Couplings—Dresser Mfg. Co.
Pipe Fittings—Dresser Mfg. Co.
Valves—Darling Valve Co.
Pumps—Gardner-Denver Co.
Chlorinators and Ammoniator — Wallace and Tiernan Co.
Dry Feed Chemical Machines—F. B. Leopold Co.
Flow Meters—R. W. Sparling.
Pressure Regulators—The Mueller Co.

Acknowledgment is made to the Pittsburg-Des Moines Steel Co. for engineering services rendered in connection with the Filter Plant.

This work was completed in the fall of 1941 for the Beckley Water Co. under the administration of the following officers:

W. A. Stanley, President and General Manager.

C. C. Farmer, Secretary and Treasurer.

A. C. Harvey, Superintendent.

FIRST YEAR OF OPERATION OF BECKLEY'S NEW WATER SUPPLY*

By E. E. CHANDLER
Chemist
BECKLEY WATER COMPANY
BECKLEY, W. VA.

THE Beckley Water Co. serves directly or indirectly approximately 6,000 consumers through 100 miles of distribution system. The storage capacity for finished water is 3,335,000 gallons. The daily consumption averages 1,000,000 gallons. Originally, the old water supply was taken from coal mines and two deep wells. This water was treated with lime for corrosion control, pumped through two pressure filters and chlorinated. The chemical analysis of the finished water was

Hardness	300 ppm
Methylorange Alk.	40 "
Chlorine residual	0.2 "
pH	8.2

The new filter plant was constructed by the Pittsburgh Des Moines Steel Co. The filters are filled with 18" of graded gravel and 30" of sand, and are equipped with revolving Palmer "Filter Sweeps," or "Filter Bed Agitators."

The chemical feed equipment consists of 4 dry feed machines furnished by the F. B. Leopold Co. of Pittsburgh and 2 chlorinators and 1 ammoniator furnished by the Wallace & Tiernan Co. The pumps were furnished by the Gardner-Denver Co. of Quincy, Illinois.

The Author
(And His Two Little "Authorettes")

A Waterless Plant for 90 Days

The plant was finished the first day of July, 1941, and the dam one month later on August first. The sluice gate was closed and we started impounding water, but there was no water to impound. The fall of 1941 was the dryest time that the people of Beckley had seen for several years.

During the latter part of September, the old supply started to fail and on October 8, we began furnishing part of the water from the new

*This paper was read before the West Va. Section of A.W.W.A.

plant. On December 1, we started supplying all the water from the Glade Creek plant.

Initial Treatment

The treatment given the water from October 8, 1941, to January 8, 1942, was alum for coagulation and color removal, aeration and carbon for odor and taste control, lime for corrosion control and chlorine for sterilization.

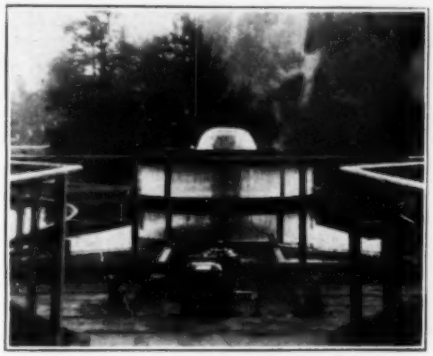
The average dose of alum for color removal was 7.6 grains per gallon. Carbon dosage was 2 grains per gallon, and chlorine dosage of 0.6 ppm. giving us a finished water with an average chemical analysis as follows:

	PPM
Color	Tr.
Hardness	82
No. alk.	30
Phenol alk.	1
Residual Cl.	0.11
pH	8.2

The analysis of the raw water was:

	PPM.
Color	*
Hardness	26
Mo. alk.	23
Phenol	0
Iron	2.0
pH	6.5

*Intensity of strong tea.



The Aerator

A View From the Door of the Filter Plant Across the Flocculation Tank Flanked by the Two Spiral Baffled Settlers.

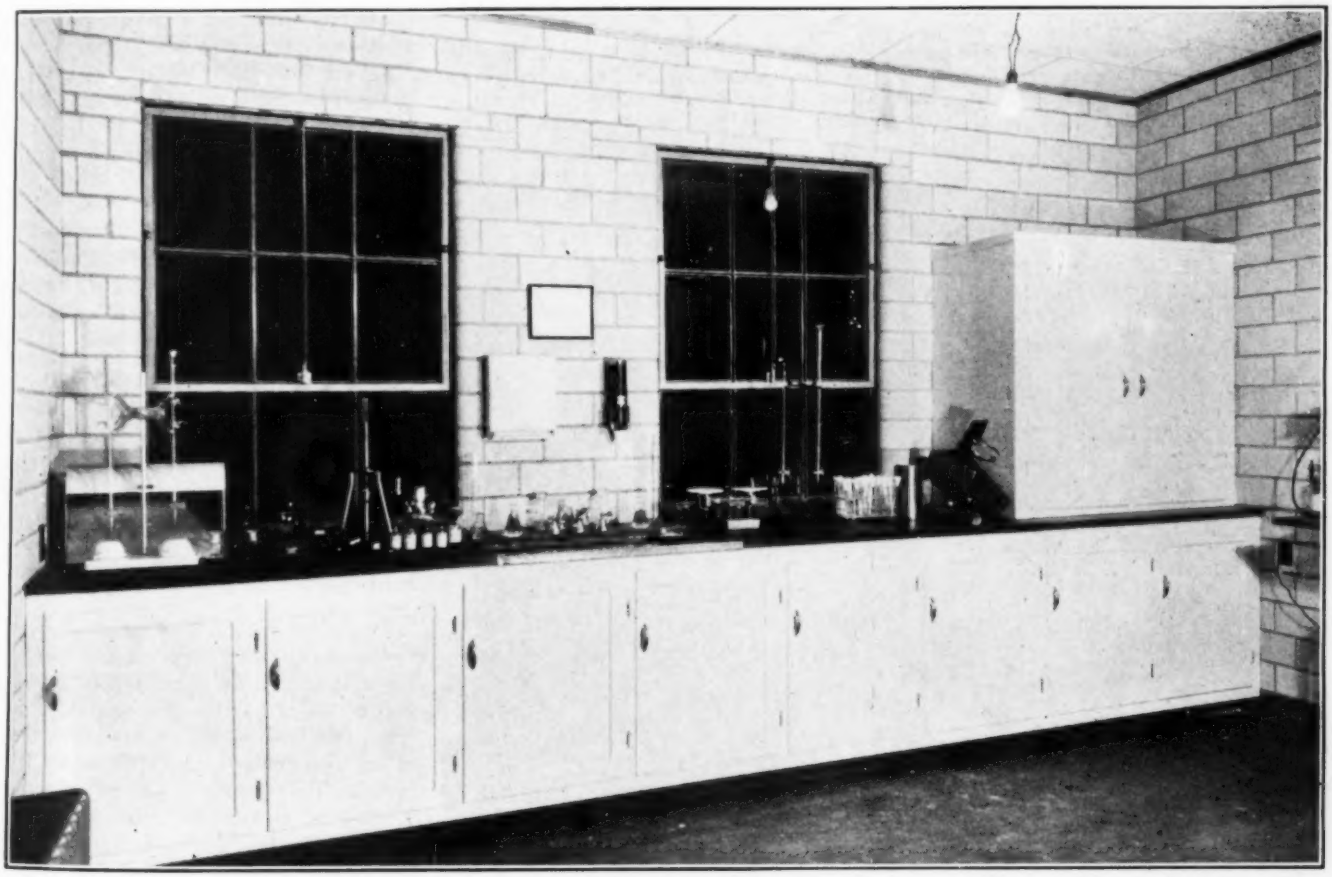
Treatment Since January, 1942

On January 8, 1942, we started using "breakpoint" chlorination. The raw water had by that time cleared up and it was found that by adding chlorine to the "breakpoint" required a dose of 1.5 to 2.0 ppm., which gave us a residual of 0.8 ppm. at the settling basin influent and 0.2 ppm. through the filters. The alum dose averaged of 1.0 gpg. and the lime dose of 0.5 gpg.; the optimum pH was 6.0. The finished water was treated with lime for corrosion control and ammonia for taste and odor control. This was necessary because the chlorine satisfied water entering the dstribution system with free chlorine reacted with the coal tar coating or other substances inside the main running to town and created a medicinal taste.

This treatment proved satisfactory until high color began to reappear. With the appearance of color, odor and taste also appeared. First a fishy odor, then one of hydrogen sulphide. The optimum pH dropped from 6.0 to 4.7 and the chlorine demand went up to the capacity of the chlorinator. It was decided to return to carbon for odor and taste control. It was found that carbon would remove the odor but not the iron, and the alum dose rose from 1 gpg. to 6 gpg. and we had to go back to the "breakpoint" chlorination.

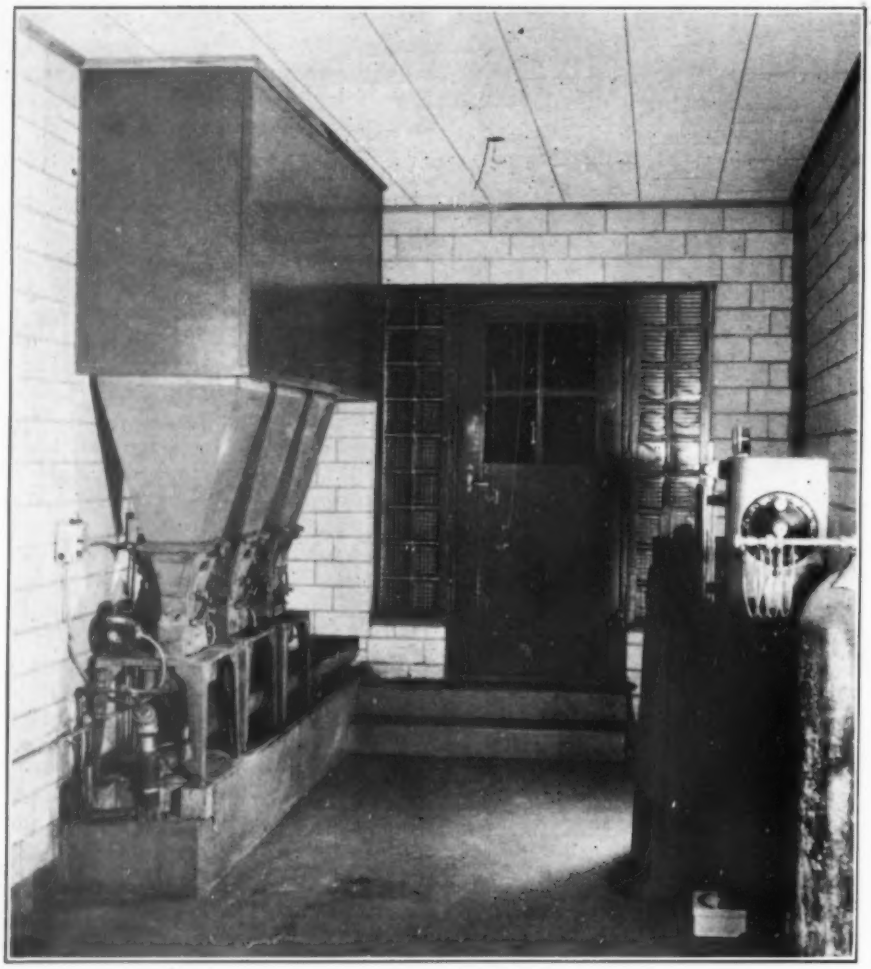
Return to Breakpoint Chlorination

After returning to "breakpoint" the alum dose dropped from the 6 gpg. to 1 gpg. We secured a chlorine gas diffuser from the State Department of Health to aid in reaching "breakpoint." This proved to work satisfactorily. We applied to the W.P.B. for a larger chlorinator, but were turned down. The chlorine demand actually went to 100 pounds per million gallons (12 ppm.) through



The Author's "Den"

One Side of the Well Equipped Compact Laboratory.



Chemical Feed Room

Dry Feeders for Three Chemicals; Raw Water Chlorinator Providing "Breakpoint" Chlorination; Ammoniator for Fixing the Residual Chlorine in the Finished Water. Note Dust Trap Above Dry Feeder Hoppers, Which Opens Into Dust-tight Chemical Storage and Charging Room on Other Side of the Wall.

Chemical Storage and Charging Room

Through the Charging Window Above the Platform Are Visible the Raised Lids of the Feeder Hoppers Within the Dust-Trap Appearing in the View of the Feeders. The Dry Chemicals Used are Alum, Hydrated Lime and Activated Carbon.

August and September.. About the first of October the demand decreased and is 4.5 ppm. at this writing—late Fall 1942.

With "breakpoint" we were doing three things, removing odor and taste, iron and color. The water also contained 1.8 ppm. manganese which did not cause any complaints, since we reduced it below 0.5 ppm. and most of the time it was nil in the finished water.

The analysis of the raw water was:

	PPM
Color	250
Iron	20
Manganese	1.8
Alkalinity	22
Hardness	27
CO_2	18
pH	5.6

The treatment gave us a finished water of:

	PPM
Color	Tr.
Hardness	37
M. O. Alkalinity	26
Phenol Alkalinity	2
CO_2	0
Chlorine Residual	0.6
pH	8.3

Filter Operation

Shortly after the plant was put in operation, mud balls began to appear on the filter beds, and gradually got worse. We tried a high rate of wash, low rate of wash, long washes and short washes, but to no avail. We purchased Palmer revolving "Filter Sweeps" (sand bed agitators) and installed them in the filters. After three weeks, the mud balls had disappeared and the sand has remained practically as clean as when placed in the filters.

Before the agitators were installed filter runs averaged 31 hours, with a maximum run of 46 hours and a minimum run of 9 hours. After they were installed, the maximum run was 105 hours and a minimum of 17 hours.

Summary

Plant operation has been successful so far with the treatment given it; that is the application of "breakpoint" chlorination for oxidation of iron, removal of odor and taste, and color removal; alum and lime for coagulation; lime for pH adjustment of finished water and ammonia treatment to prevent taste in finished water. Also, with Palmer "Filter Sweeps" better filter operation has resulted.

THE WATERSPHERE OF MADISON, WISCONSIN

Some Notes On Design, Construction and Service Performance

By L. A. SMITH
Superintendent of Water
MADISON, WISC.

The Author

THE Water Department of Madison, Wisconsin, in line with other public utilities, recognizes the necessity of maintaining adequate service to all of its consumers at all times.

In a water utility, first-class service consists of an ample supply of pure water at adequate and dependable pressures. In order to have continuous records of pressures in the distribution system, ten water pressure gauges have been installed in various parts of the distribution system, in addition to the gauges at the pumping station. Especially are these records maintained for the purpose of determining the variations in pressure which occur in the outlying areas. This is necessary because, in a rapidly growing community, flow conditions change and reinforcing mains must be installed in areas where demands for water have risen rapidly. This was particularly true in the Nakoma area in Madison, because the number of takers increased from 240 in 1932, when this area was annexed to the city, to 1,120 in 1942. The elevations in this area average considerably higher than in the main portion of the city.

In 1926, a 6,000,000 gallon reinforced concrete high service reservoir was constructed at an elevation of approximately 50 feet above the highest point in the annexed territory. This reservoir furnished reasonably satisfactory service at the time annexation took place; but, as the number of houses increased, it did not provide adequate pressure nor ample capacity. It, therefore, became necessary to install a booster pump to serve the annexed area and certain other adjacent areas which were also at a high elevation.

A Booster Station Installed

The first booster pump installed had a capacity of 325 GPM. Subsequently, as the territory developed and the demand increased, an additional pump with a capacity of 550 GPM was installed. These pumps were provided with controls so that either could be operated individually or they could be operated together. From midnight to six in the morning the booster pumps were shut down because the demand for water was very low during these hours. The supply pressure then depended upon the water elevation in the high service reservoir. This was reasonably satisfactory when the reservoir was filled to capacity, but if for any reason the water level was drawn down, the pressure was insufficient to provide running water above the first floor in some of the homes at the higher elevations.

The matter of fire protection was also becoming increasingly important because of the large amount of home construction in this vicinity. Obviously, with both of the booster pumps running, one or two fire streams could be furnished, in addition to the ordinary domestic demand. During peak sprinkling periods, however, such was not the condition.

Madison's 100,000 Gallon "Watersphere"
(This photograph by the author)

A Study of Improvements

In 1936, it became apparent that the service here would have to be materially improved and three proposals were analyzed:

1. To build a larger booster pumping station and install higher capacity booster pumps.

2. To drill a unit well and install pumps to furnish adequate pressure, operating this area as a separate district.

3. To provide elevated storage.

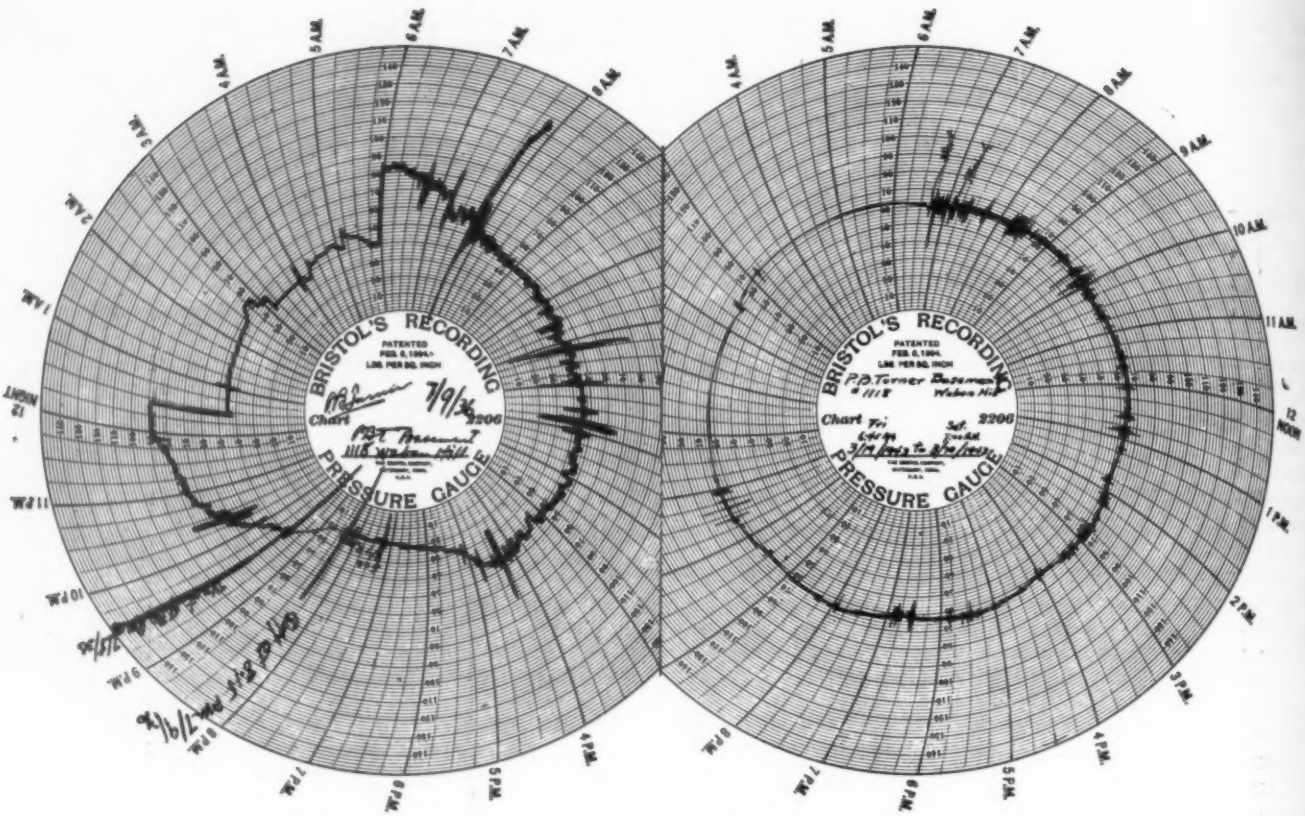
A study was made of the fluctuations in pressure in the area. A pressure gauge maintained in one of the homes at a high elevation revealed that pressures varied through a range of nearly 40 pounds, being inadequate at the highest elevation in times of peak demand and excessive in low elevations at times of minimum demand.

It was decided that the construction of a larger booster station and the installation of higher capacity booster pumps would only accentuate the difficulty in lower elevations. The proposal to drill a unit well and to handle this area as a separate district was discarded. In addition to increased operating costs to insure continuous service an additional well for reserve in case of emergency would be required, making the cost prohibitive.

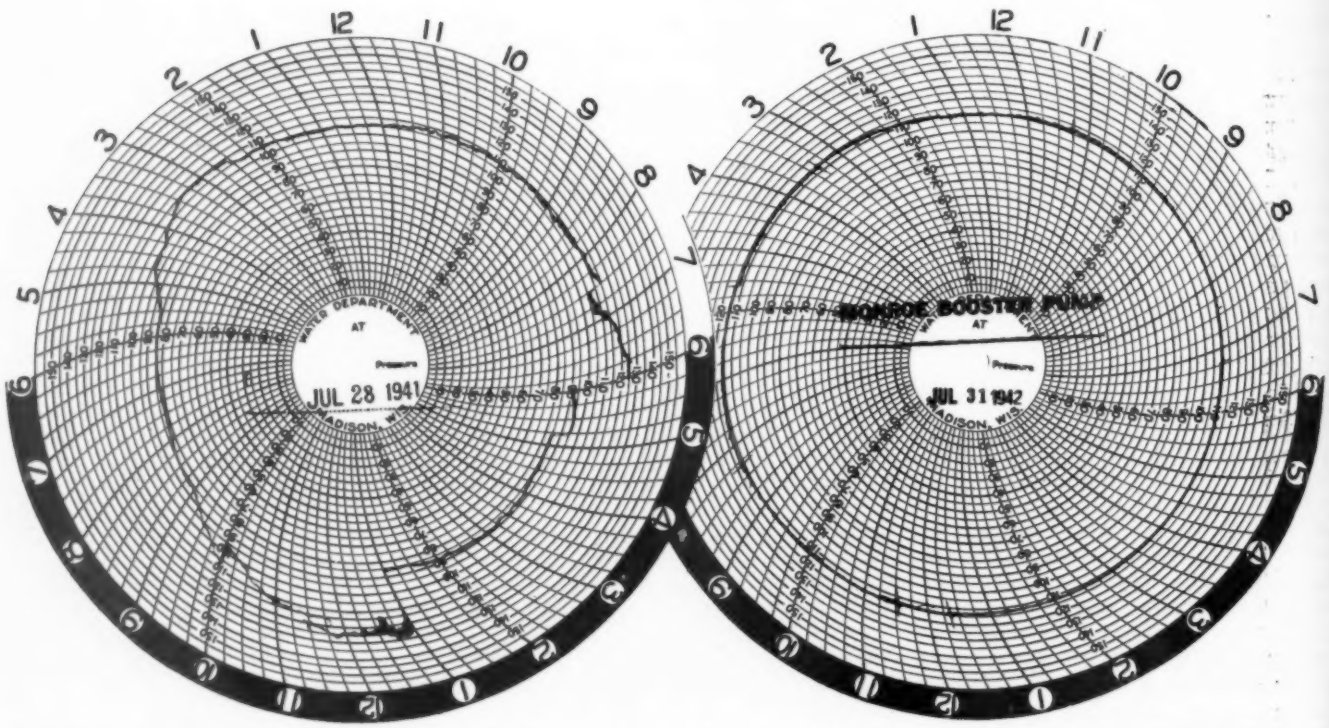
The third proposal—to provide elevated storage—was the one finally adopted.

Considerations in Providing Elevated Storage

From a topographical map of this area, three locations were chosen as being of sufficient elevation to be suitable for the location of an elevated tank. In providing elevated storage, three items of cost have to



Figs. 1 and 2—Pressure Charts Before and Since Installation of Madison's "Watersphere"
(Taken in the same home the chart on the left reveals why elevated storage. That on the right shows pressure variations, day and night, of less than 5 lbs. at consumer's service tap.)



Figs. 3 and 4—Charts from the Booster Station. (These charts, taken exactly one year apart, reveal that pressure variations of 80 to 125 lbs., before the "Watersphere," now hold within a 7 lb. range at 110 to 117 lbs. whether pumps are on or off.)

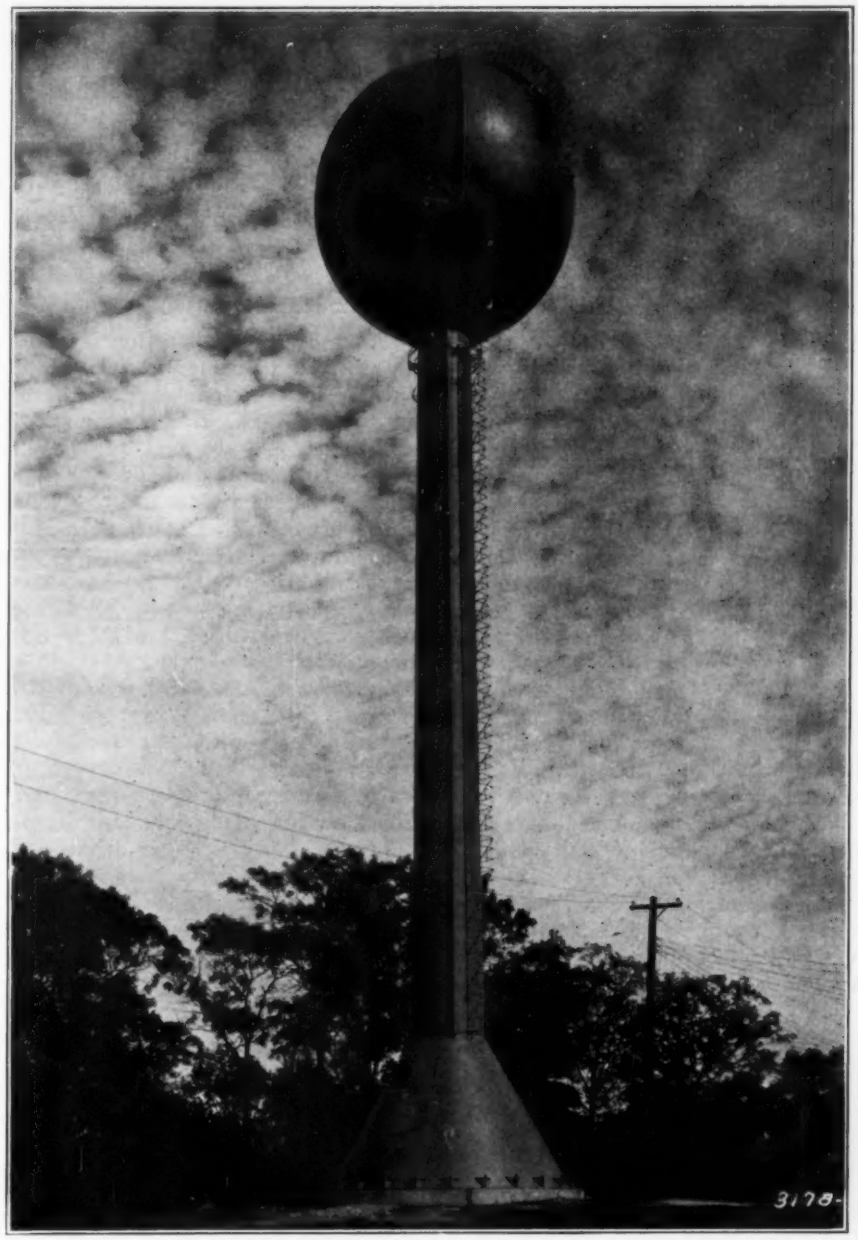
be considered. First, the cost of the tank itself; second, the cost of the necessary pipe line to connect the elevated storage to the distribution system; and, third, the cost of the site itself. Of the three sites chosen, one was not available except through condemnation and the other two were approximately the same distance from a large main in the distribution system. It happened that the higher of these two sites was also the least expensive and therefore was selected.

Little information is available in waterworks literature which can be used as a basis for determining the most economical capacity for elevated storage tanks. Therefore, this important element was determined by an analysis of the local factors involved. The houses in this vicinity were modern in type, with fire resisting roofs and ample lot areas, so that the danger from conflagration was comparatively slight. It was decided that four fire streams (1,000 GPM) would be the maximum required at any one time and that such streams should be available for a minimum of one hour. This resulted in the determination to provide a 100,000 gallon capacity tank which would provide the four fire streams continuously for a period of 100 minutes, assuming that the booster pumps would be able to meet the domestic demand during a fire.

The Aesthetic Angle

Whenever an elevated tank is proposed for any district, the people in that district generally are opposed to having it close to their homes, particularly if they have not been conscious of its necessity. The matter was presented to various companies manufacturing elevated tanks, advising them of the fact that since this tank was to be erected in a residential district, their most pleasing architectural designs should be submitted. There were three suggestions which merited consideration. 1. An elevated tank supported on four legs in which special care be taken to make the design simple and pleasing in appearance. 2. A suggestion that an ordinary elevated tank be built and surrounded with masonry or brick. 3. The new "Watersphere" design, consisting of a pedestal, riser pipe, and spherical tank. Taking all factors into consideration, the last suggestion seemed to be overall the best. The "Watersphere" was selected because it is not only pleasing in appearance, but was also economical in the use of metal.

Instead of painting the tank with aluminum paint and lettering the name of the city on the sphere, a neutral blue-green color was selected which would blend in with the trees and the sky. No lettering or ornaments of any kind were used on the tank. It has now been in service for over a year and I have had no adverse comments. In fact, many of the people in this vicinity take pride in its appearance and tell me that they are glad it was erected where it was as it provides a good landmark. The streets in the adjacent area are curved and run into each other in Y connections, so that the location of this tank is a real asset to the people living here in directing people to their homes. (See cover picture.)



The "Watersphere" of Madison, Wis.
(Photo by courtesy Chicago Bridge & Iron Co.)

Elements of Design of the "Watersphere"

On first glance the design appears to be unstable, because the riser seems to be too small for the sphere. In the accepted design wind forces were assumed to be 20 pounds per square foot of the projected area of the spherical and conical surfaces of the tank and base frustums, and 25 pounds per square foot of the projected area of the riser itself. These values are much higher than the commonly specified 15 pounds per square foot for spherical and 18 pounds per square foot for cylindrical surfaces. The base cone frustum, which rests on the foundation, is not filled with water. Just above the top of the base frustum, in the riser

proper, is an inverted head (convex to pressure) which withstands the pressure due to the water in the tank and in the riser. This head is inverted so that the horizontal component of its peripheral reaction is radially outward and balances the horizontal radially inward component of the reaction from the top of the base frustum. An extremely heavy reinforced concrete foundation was used, the diameter being over 35′ and the depth nearly 10′. This not only provided an adequate foundation from the standpoint of bearing pressures, but also added to the stability of the structure by reason of the weight of the concrete itself.

The base cone frustum, which is 26′ in diameter at the bottom, tapering to 8′ at the top, is approximately 16′ high and supports a riser column 80′ high, having a diameter of 6′ at the top. This riser is designed for a maximum stress of 12,000 pounds per square inch at any point due to a combination of metal, water and wind loads. Common practice for structural towers allows 15,000 pounds per square inch for water plus metal loads and an increase of 25 per cent when wind loads are included. The design of the Madison unit is, therefore, extremely conservative. It provides a minimum ¼″ thickness of steel, including the part above the high water line. The maximum computed stress in the spherical portion is 10,000 pounds per square inch. The entire structure is butt welded with fusion over the entire plate thickness.

Service Performance

The results that have been obtained from Madison's "Watersphere" are almost spectacular, as shown by the charts illustrated. *Figure* 1 shows a pressure chart taken from one of the homes located in the higher area on July 9, 1936, when this problem was being studied. It will be noted that the flow conditions were very erratic, as the pressure varied over 75 pounds. *Figure* 2 shows a pressure chart taken recently at the same home. Pressure conditions have now been stabilized, with no great fluctuations. *Figure* 3 is a pressure chart of the Monroe Street Booster Pump, taken on July 28, 1941, before the tank was put into service, which shows a fluctuation of 40 pounds, 85 pounds at the minimum and 125 pounds at the maximum. *Figure* 4 is a chart taken July 31, 1942, a year later, after the 100,000 gallon "Watersphere" was put into operation, and shows a maximum variation of approximately 7 pounds. These two days—almost a year apart—were selected as they represent two days in which the pumpage was about the same. Charts from the recording gauge at the base of the elevated tank reveal that the pressure variation is limited to less than 3 pounds, the pen traveling along between the 45 lb. and 50 lb. lines.

The method of operation is as follows: No. 1 pump, which is the smaller unit, starts at 110 psi and stops at 115 psi. No. 2 pump starts at 105 psi and stops at 115 psi. If the pressure drops to 105 psi, while No. 1 pump is running, No. 2 pump automatically starts. Both pumps continue to run until the pressure reaches 115 psi, when both stop automatically and the cycle is ready to be resumed. The necessary time delay switches and contact controls have been installed to prevent danger to the equipment if both pumps were to start simultaneously. The operation of the switches turns on various colored lights so that an inspector can determine, by looking into the building, just what units are running and what the conditions in the distribution system are. A hand control is also provided so that the pumps may be run individually or simultaneously.

The cost of the entire project is as follows:

Site	$ 2,000.00
Foundation	1,996.00
Pipe line extension	809.85
Elevated tank proper	14,970.00
Landscaping	1,561.65
TOTAL	$21,337.50

Cranch Becomes Director of Public Works for New Rochelle, N. Y.

Eugene T. Cranch, until recently President of the New Rochelle (N. Y.) Water Co., has recently been appointed Director of Public Works of New Rochelle, N. Y.

"Gene" Cranch

Mr. Cranch, who became a well-known civic leader in New Rochelle, and who is also well known for his prowess in the field of water production, will assume his new duties on June 1.

Mr. Cranch, who was graduated from the University of Michigan in 1918, was a sanitary engineer in the army in World War I, from which he emerged as a lieutenant after having enlisted as a private. His experience covers a wide field of engineering and business activities. At one time City Sanitary Engineer for Port Arthur, Tex., and later associate professor at the University of Kansas, Superintendent of Water at Petersburg, Va., Assistant City Engineer at Rochester, N. Y., and designer of sewage treatment plants as well as manager of the New Rochelle Water Co. since 1927, Mr. Cranch brings to his new appointment a background that will prove invaluable both to him and the city.

Civic minded and a member of many business and professional organizations, Mr. Cranch has also maintained an interest in studying economics and city management. To readers of WATER WORKS AND SEWERAGE he is best known for his several meaty, practical articles which have been appearing over a period of years. To us it is particularly significant that New Rochelle had no intention of losing a valued citizen who sold himself to town officials while handling the difficult job of being head of a privately operated utility. That's "Gene" Cranch!

Raritan Valley Boys Get a "Raw-Deal"

(A Correction)

In our April issue appeared a picture of twelve of the eighteen members of the Raritan Valley Section of the New Jersey Sewage Works Association attending the annual meeting of the parent association in Trenton.

Our serious mistake was in captioning this group "The Rahway Valley Section"—and about this we have heard in no uncertain terms. Our apologies for the "Rah-Deal" given the boys from the Raritan Valley. However, we are still nonplussed over the geography of New Jersey, which puts the Rahway River in the Raritan Valley—but so it seems, unless the Rahway boys just "snuck" into the Raritan Section.

THE PROCUREMENT AND ASSIGNMENT OF SANITARY ENGINEERS BY THE W. M. C.

The Needs and Objectives of the War Manpower Commission in Its Function of Most Equitably Procuring and Assigning Sanitary Engineers for War and Post-War Service

By CAPTAIN C. W. KLASSEN*
Sanitary Corps
U. S. ARMY

SANITARY engineers trained to recognize and control environmental conditions which may cause diseases, often in epidemic form, have always been limited in number. Their activities during peacetime have resulted in disease prevention and health protection to the civilian population through improvements in sanitation which includes the purification and protection of water supplies, control of swimming pools and bathing areas, the collection and proper disposal of wastes (particularly domestic sewage), the elimination and control of rodents and insects capable of carrying disease, especially mosquitoes which transmit malaria, problems of industrial hygiene, housing, and others. Sanitation problems in this country are fairly well defined and have furnished valuable basic knowledge to sanitation personnel in the Armed Forces for the solution of many problems now being encountered in many parts of the world.

The present critical shortage of trained sanitary engineers has been brought about by the needs of the Armed Forces for the services of such men in all parts of the globe where our fighting men are located. The job of helping to protect the troops against many of the diseases, transmittable through improper sanitation and insects which may exist in those localities, has already necessitated a large withdrawal of trained personnel, particularly from many of the state and local health agencies and from local water and sewerage departments. However, the military needs for such personnel have not yet been fully filled.

Functions of the War Manpower Commission

The War Manpower Commission is faced with the problem of making the best use of the dwindling number of persons trained in sanitary engineering for military, semi-military and civilian purposes. In order to accomplish this, it is necessary to establish a more uniform system of procurement and assignment of such trained individuals than has been applied up to the present time. In order to assure sufficient trained personnel to maintain the necessary level of health protection through sanitation in the Armed Forces (without, however, depriving the civilian population of the essential health services furnished by such persons), this new Procurement and Assignment Service for Sanitary Engineers is now engaged in three principal functions:

(a) Determining the military and civilian needs for sanitary engineering personnel for this country and abroad.

(b) Estimating the availability of sanitary engineering personnel of various ages and grades of experience.

(c) Establishing a plan for a well balanced allocation of such persons insofar as practicable to meet the civilian and military needs.

Where Sanitary Engineers Are Needed Most

The needs for trained personnel in the Armed Forces covers a wide field and is made necessary to cope with the control of environmental problems, many of which are peculiar to the areas where our fighting forces are located. These include new problems in water supply protection and treatment, insect borne diseases such as malaria, yellow fever, filariasis, dengue, typhus and others. In *this* country many of the health problems encountered in the past among our own civilian population, and with which we are familiar, are also those of the Armed Forces. Likewise, in foreign lands the disease hazards of the native population of an area where troops are located naturally becomes important to the Armed Forces. Problems previously known to us only through references or literature now become real. Wherever troops go, whether it be to a college or camp for training or to a theater of operation for combat, health protection through sanitation must be adequate. Thus we find trained personnel needed for malaria control units for operation in all parts of the world; men with design, construction and operation experience in water supply and sewerage facilities, in addition to a knowledge of malaria control, for activities in some regions. Sanitary engineers for the Sanitary Corps of the Army are needed for the camps in this country in connection with the Medical Department activities in the inspection, recommendation and supervision of the sanitary quality of water and the safe disposal of sewage and other wastes. Also, for example, in army air fields and our overseas bases the Corps of Engineers design, construct and operate water supply facilities, while the Medical Department has the same duty in regard to sanitary matters as it has at camps and posts in this country. Sanitary engineers for the Sanitary Corps are needed for all of the army's divisions and task forces. Sanitary engineers are also included in the plan for the military government units which will operate in occupied areas. Later such engineers will also be necessary in the foreign relief and rehabilitation programs in such areas. The Army Corps of Engineers needs personnel for the operation of its water and sewerage utilities. Likewise, semi-military needs, primarily those of the United States Public Health Service, include personnel for malaria control in important war areas in this country, for industrial hygiene problems in the war industries, for general sanitation work in the state and local areas, in addition to the need for men for foreign service in the Pan-American Sanitary Bureau, in Ha-

*Detailed to the Procurement and Assignment Service, War Manpower Commission, Washington, D. C. Former Chief Engineer, Illinois Dep't of Public Health.

waii on general sanitation, and in Alaska.

The Sanitary Engineer on the Home Front

The number of trained sanitary engineers needed for the Armed Forces in this country and abroad for the coming year are now known. In determining the civilian needs, it will be necessary that the civilian use of such trained sanitation personnel be based upon the essentiality of the particular position as it relates to the war effort. Many positions in the water works field, especially in important war areas, obviously come in this category. Some civilian sanitation activities not directly related to the war but considered necessary during peace times, may have to be materially curtailed, dependent upon the available supply of trained personnel for civilian uses.

In this connection, the Procurement and Assignment Service is keeping in mind that probably all of the trained personnel in this field below the age of 38 years that are physically fit for military duty will be utilized in the Armed Forces. Thus it must be anticipated that a further withdrawal of such men from their civilian positions is probable. It, therefore, becomes necessary that no time be lost in training persons (both men and women) who are not qualified for military service to replace these younger men. In the water supply and sewerage field, the technical associations must share in this responsibility. Already a plan is under way in the field of public health to replace these younger trained men by persons in the older age group after they have been given proper instruction and training. Similar plans are contemplated for such a replacement training program in other fields of sanitation such as in the operation of water and sewerage facilities.

Classification of Sanitary Engineers Under Way

To determine the availability of persons trained to meet all of these military, semi-military and civilian sanitation needs, including those suitable for replacement training, a roster is being rapidly developed and the qualifications of persons are being reviewed to determine where they best may serve.

"For the purposes of the Procurement and Assignment Service of the War Manpower Commission, the professional occupational designation 'sanitary engineer' shall apply to a graduate of an approved scientific engineering school,* (1) who is designated a sanitary or public health engineer by a state, county, or municipal health department in which he is employed; or (2) who has fitted himself by suitable training, or study, and by experience to conceive, design, construct, operate, direct, and manage engineering works developed, as a whole or in part, (a) for the protection and promotion of the public health or (b) capable of injuring the public health.

Ability to identitfy, evaluate, and explain, in terms of their sanitary or public health implications, those factors connected with engineering works that will prevent injury to health or that will promote health, in addition to ability to conceive, design, construct, operate, direct, and manage such works shall constitute the basis of differentiation between individuals qualified as sanitary engineers and individuals qualified only as civil, mechanical, electrical, mining, or chemical engineers."

[*In exceptional circumstances, eight years of suitable experience and study that give evidence of the acquisition of proficiency in the fundamental engineering sciences as well as in engineering technique may be considered equivalent to graduation from an approved scientific engineering school.]

Based upon the training, experience of an individual, he will fall into one or more of the following classes:

I. Public Health.

II. Design and construction of water, sewerage and drainage facilities.

III. Manage and operate water and sewerage facilities.

IV. Industrial Hygiene.

V. Teaching and miscellaneous.

Obviously, the water works and sewerage professions include a large number of men coming within this definition and classification, both of which are sufficiently broad to include persons who will meet the civilian and military needs for sanitation personnel.

Anyone coming within the scope of this definition is requested to place his name with the War Manpower Commission. And, for any further information, communicate with the Procurement and Assignment Service, War Manpower Commission, 1006 U Street, Washington, D. C.

[Ed. Note: Captain Klassen, in presenting this statement before the Maryland-Delaware Water and Sewerage Association in Baltimore, Md., May 14, also reviewed a listing of specified positions and personnel in public health, water supply, sewage disposal and general sanitation services which are being defined as essential on the home-front and therefore are not to be taken for military or other service. This important listing is soon to be released and it is planned to reproduce it in our June issue for the guidance of our readers. However, it is believed proper at this juncture to remark that water supply and sewage disposal are not to suffer to any really serious degree as a consequence of drafting for duty the key men in these essential home-front services.—L. H. E.]

New Short Courses in Sanitary Engineering

New, short, intensive Summer courses in sanitary engineering for persons with two or more years of college training or equivalent practical experience in sanitary engineering have just been announced by the War Manpower Commission and the U. S. Office of Education. Ten to sixteen week courses will be offered, tuition free, at seven colleges located near important production centers. The courses are expected to aid in meeting civilian health problems by providing sanitary engineers and assistants for crowded areas. Experience has proved the adequacy of the training for upgrading partially qualified technicians. Institutions at which the courses will be offered include:

Alabama Polytechnic Institute, Auburn, Ala.

George Washington University, Washington, D. C.

Univ. of Michigan, Ann Arbor, Mich.

Univ. of Texas, Austin, Tex.

Polytechnic Institute of Brooklyn, N. Y.

Univ. of Southern California, Los Angeles.

Oregon State College, Corvallis, Ore.

Frank W. Jones Commissioned Regional Sanitary Engr.

Frank Woodbury Jones, partner in Havens and Emerson, Consulting Engineers, Cleveland and New York, has been appointed Sanitarian in the Reserve, United States Public Health Service, and has been assigned to duties as Regional Sanitary Engineer, Fifth Area, O.C.D.

INDIANA SECTION'S 36TH ANNUAL MEETING

Calvert Voted Fuller Award; Schwartz Elected A.W.W.A. Director

By GEORGE E. SYMONS
Associate Editor

MEETING in the Capitol City of the State on April 29-30, with several of its charter members present, the Indiana Section of A. W. W. A. held its 36th annual meeting. Registration totaled 201 persons. Cecil K. Calvert, Supt. of Purification of the Indianapolis Water Co., and A. W. W. A. Director, who lacked but three weeks of having been a charter member of the Section and for a number of years secretary of the Section, was voted the Fuller Award.

Technical sessions devoted to well cleaning, chlorination trends, wartime problems, drinking water standards, and other subjects were interspersed with luncheons, a motion picture, strolling players, a colored quartette, and the annual dinner, complete with after dinner speech. Harry Jordan closed the session with an address at the Friday luncheon, at which time he spoke, with his customary verve, about the currently all important three M's—"Manpower, Materials and Mutual Aid."

Employer-Employee Relations

Cyrus E. Wood, Personnel Director of the E. C. Atkins Co., Indianapolis, long time manufacturers of saws, led off the technical sessions with some very practical comments on the subject of em-

Fuller Award
Cecil K. Calvert
Supt. Filtration
Indianapolis Water Co.

Director, A. W. W. A.
M. H. Schwartz
Supt. & Gen. Mgr.
Vincennes Water Co.

ployer-employee relations. Pointing out that we can no longer say there are "two sides to the table," Mr. Wood said we must consider that labor and management are on the same side of the table if we are to solve the problems of both the present and the future. "The greatest need today is for the practical application of the Golden Rule." Actual cases were cited to prove this point. Plants designating workers as "members" are having fewer personnel problems and receiving the benefit of employee suggestions instead of receiving employee grievances. Men are willing to cooperate if given the opportunity to talk with their feet under the same table, but management and personnel directors must be absolutely square in their dealings with labor.

Chairmen

E. F. Kinney
Wallace & Tiernan
Indianapolis
(Outgoing)

H. W. Niemeyer
Supt. Dist.
Indpls. Water Co.
(Incoming)

"Meter Readings Under Present Conditions," by Mr. W. C. Shoemaker, General Manager of the Richmond Water Works Corp., covered several phases of the manpower question as well as the problems of obtaining meter readers, who as a class are non-deferrable in an otherwise essential industry. Mr. Shoemaker suggested several experiments, including the hiring of boys, the averaging of accounts, obtaining postal readings from the householder, hiring men too old or unfit for the draft or hiring women. Although the speaker did not favor the hiring of women for several reasons, he did read a newspaper clipping about the "Meterettes" in Gary, where the experiment has proved successful, and the girls have seemingly improved public relations for the time being at least.

How to Teach a Man, a Job

Adopting the pedagogical scheme of class participation, **Prof. C. H. Lawshe** of Purdue University gave an enlightening and enjoyable lecture on **"Practical Applications of In-Service Training."** Pointing out that if a man could not teach one person it was impossible to teach a group, Prof. Lawshe went on to demonstrate the weakness of "telling" or "showing" as methods of teaching. Using the tying of the Fire Underwriters' Knot as the "job" and the help of the "boys" in the front row proved his point. Combining the two methods, the professor demonstrated "Skipper Allen's Method" for teaching a new man a new job.

The four principles of sound instruction were set forth by the speaker as follows:

Step 1—Prepare the Learner

Put him at ease.

Find out what he already knows about the job.

Get him interested in learning the job.

Place him in the correct position.

Step 2—Present the Job or Operation

Tell, show, illustrate and question —carefully and patiently.

Stress the key points.

Instruct clearly and completely, taking up one point at a time, but no more than he can master.

Step 3—Tryout Performance

Test him by having him perform the job.

Secy.-Treas.
C. E. Bechert
State Engr.
Dept. Conservation
Indianapolis

Vice Chairman
Clarence D. Adams
Water Plant Supt.
New Albany

Have him *tell* and *show* you; have him explain key points.

Ask questions and correct errors.

Continue until you know HE knows.

Step 4—Follow-up

Put him on his own.

Check frequently. Designate to whom he goes for help. Encourage

questions. Get him to look for key points as he progresses. Taper off extra coaching and close follow-up.

Prof. Lawshe concluded with the statement that *"If the learner hasn't learned, the instructor hasn't taught."*

Concerning the New Drinking Water Standards

C. K. Calvert, Supt. of Purification of the Indianapolis Water Co.,

Programmers

Jos. L. Quinn, Jr.
Act. Director
Div. of Sanit.
Ind. Bd. Health

F. A. Schaefer
Supt. Pub. Ser. Co.
New Albany

L. S. Finch
Prin. Asst. Engr.
Indianapolis Water Co.

commented on the new drinking water standards of the U. S. Public Health Service, calling attention to the fact that thirty years ago one sample of one ml. was examined for bacteria, whereas today five portions of 100 ml. is the "standard sample," however, more generally five portions of 10 ml. will be examined as the permissible alternate "standard sample." Because of the increase in the number of samples scheduled to be analyzed each month to meet the new standards, most laboratories will have to purchase additional supplies of glassware and other materials used in the testing. Where a laboratory uses 100 ml. portions it will find the cost of media increased. For Indianapolis, 100 samples may be analyzed using 10 ml. portions for approximately $0.80, but the same number of samples using 100 ml. portions will cost approximately $2.00.

With "breakpoint" chlorination resulting in lower bacterial contents and new equipment (available after the war) for controlling and recording chlorine dosage, it may be expected that the new standards will be more easily met than in the past. According to these new standards which allow 10 per cent of all 10 ml. portions or 60 per cent of all 100 ml. portions to be positive, the most probable number of coliform bacteria allowed will be 2.2 per 100 ml. and 0.92 per 100 ml., respectively.

Calvert also spoke very briefly of the work of the committee on the revision of the Chlorine Section of the new Standard Methods. (Your reporter was privileged to sit in on a conference of this committee the previous day and saw and heard how painstakingly its members have worked toward the clarification of the chlorine section.) Principal changes include the approval of commercial comparators, the method for making mathematically and physically correct permanent color standards, the use of daylight lamps, a more acidic reagent, and absolutely new tests for the determination of *true* residual chlorine. It is expected that the committee report will be published in an early issue of the A. W. W. A. Journal.

In discussing Mr. Calvert's remarks, Mr. B. H. Jeup, Chemical Engineer of the Indiana Board of Health Water Laboratories, told about how the new drinking water standards will affect the routine operations of the water laboratories. Until more equipment is available, it may not be possible to collect the required number of samples in all cities. All sample bottles will contain a small amount of sodium thiosulfate for the purpose of dechlorinating samples which contain excess chlorine.

Wells and Water Tables

"Maintenance of Wells" by N. E. Gunderson of the Layne-Northern Co., Mishawaka, Ind., was a talk on the maintenance of well production. Causes for the decrease in well capacity may be several, but the most common is plugging of the gravel or surrounding rock by the deposition of carbonates. Production or capacity of wells should be determined in gallons of water per foot of drawdown, because the yield (except in

Hosts

H. S. Morse
Gen. Mgr.
Indianapolis Water Co.

Leo Louis
San. Engr.
State Bd. Health
Indianapolis

Gen. R. H. Tyndall
Mayor
Indianapolis

isolated cases) is proportional to drawdown. Pumps should be pulled at regular intervals for cleaning, and well cleaning should be resorted to when yield drops appreciably. Methods of cleaning wells include vibrating the screens, acidizing, and dynamiting. By means of a table demonstration, Mr. Gunderson showed (1) the effect of stabilizing the acid in order to prevent the deposition of colloidal iron in the well, (2) the effect of inhibitors on the acid to prevent the attack on metals, and (3) the accelerated action of heated

Programmers

W. C. Shoemaker
Mgr. Richmond Water Works Corp.

Wm. A. Hanley
Chief Engr.
Eli Lilly Co.
Indianapolis

A. E. Griffin
Technical Service
Wallace & Tiernan
Newark, N. J.

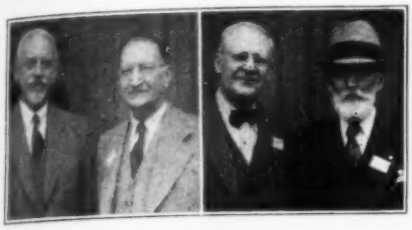
acid, the heating being accomplished by the introduction of a small amount of metallic magnesium which reduces the acid strength only 5 per cent.

"The Indiana Water Table" is receding, according to Charles E. Bechert, State Engineer, Dept. of Conservation. Of the billions of gallons of water taken from the ground in the last several years, only 97 per cent has been from recharge, the rest being from storage. Indiana has a program to study this ground water problem and has appropriated $15,000 annually for ten years to make the study. Other monies available will bring the total during the first year to $50,000, of which $30,000 will be spent on stream flow measurement stations, $15,000 on the installation of observation wells to raise the total from 66 to over a hundred, and $5,000 on the installation of 30 natural lake level gaging stations. Data collected from these wells and stations will be correlated to weather bureau observations.

Dr. Wallace W. Hagan, Geologist, showed one of the Gish-Rooney Electrical Earth Resistivity Instruments, first used by the Illinois Geological Survey to locate ground water strata. This instrument "is not a modern divining rod or a doodlebug." It was developed for the purpose of studying gravel and rock strata by measurements of electrical resistivity of the earth. Its application to finding water layers in sand and gravel is a later development.

Griffin on Chlorination Trends

"The Latest in Chlorination Trends" was set forth in a paper by A. E. Griffin of Wallace and Tiernan Technical Division. "It is evident," said Griffin, "from developments in the field that the main trends in chlorination at the moment are



Old Timers

(1) *Dr. Harry Barnard, Retired, Organizer of Indiana Section*

(2) *William C. Mabee, Chief Engr., Indianapolis Water Co.*

(3) *Wm. T. Birch, Birch Mfg. Co., Chicago*

(4) *J. F. Bradley, Chief Engr., Valparaiso*

toward (1) the production of a true free chlorine residual, either at the plant or in the distribution system or both; (2) preservation of water quality within the system; and (3) the development of tests to quickly and accurately detect the presence or absence of true free chlorine residuals, both at the plant where control is needed, and in the system where a check on the residual and *its type* is highly desirable."

The ability to produce and maintain true free chlorine residuals has had the effect of calling attention to the water quality in the interim between the plant and the consumer tap. Eradication of pathogens has long been possible but the maintenance of true free chlorine residuals in the system has shown additional benefits such as the betterment of tastes and odors, the subduing of corrosion and red water, and maintenance of pipe line capacities.

Griffin cited data from the literature to call attention to the trends and mentioned several instances where break-point chlorination had not only eliminated tastes and odors, but had appreciably reduced the coliform content below that obtained by marginal chlorination.

Inasmuch as the new drinking water standards require samples from the distribution system, it appears that the trend will be more and more toward the maintenance of a true free chlorine residual in the system. Organisms other than pathogens existing in distribution systems cause corrosion losses of 2 per cent a year, according to one estimate, and the trend toward free chlorine residual in the system may be expected to lower this figure.

The development of the Laux test, the Laux-Nickel test, and the Moore test to determine free chlorine or distinguish between free chlorine and chloramine residuals is a definite trend indicating the increased application of breakpoint chlorination as tests become available and standardized for control of the treatment.

Joseph L. Quinn, Acting Director of Environmental Sanitation of the Indiana State Board of Health, spoke briefly on the attempt to have a licensing law passed by the state legislature. Apathy on the part of most operators and activity on the part of politically appointed operators acting through the Municipal League succeeded in defeating a proposal to set up machinery whereby operators of water plants would hold their jobs by virtue of qualification attested by the passing of an examination rather than by virtue of their political affiliations.

The afternoon session was concluded with a presentation of the motion picture, "Target for Tonight," the authentic picture of the operation of the British Bomber Command. Suffering from the reverberations of an accoustically imperfect banquet hall and poor synchronization of sight and sound, the picture still conveyed the idea of good organization and cooperation of men and services, thoroughness of preparation, and daring of the flyers, as well as the anxiety of the ground crews and officers for their brothers in the sky.

The Annual Dinner

Dinner Thursday night was accompanied by strolling musicians of ability and followed by a negro quartet singing many old barber shop harmonies and spirituals. Cecil K. Calvert acted as toastmaster, introducing Dr. Harry Barnard, the man who as director of the Board of Health 35 years ago was responsible for the first meeting which led to the formation of the Indiana Section. A Mr. Kane of the Department of Conservation gave two impersonations, after which the Fuller Award Committee made its report. It was a pleasure to watch the sudden look of astonishment, followed by a faintly flickering smile on the countenance of the toastmaster as Paul Laux, Chairman of the Award Committee, built up to the climactic announcement as follows: "For long and faithful services in the interest of the American Water Works Association and for his outstanding work in the field of water purification and taste control, this committee presents for the George W. Fuller Award the name of Cecil K. Calvert."

A Little Private "Round-Table"

H. A. Faber, Chlorine Inst., New York
C. K. Calvert, Indianapolis Water Co.
A. E. Griffin, W. & T., Newark

(In action, revising the Chlorine Section of Standard Methods.)

Programmers

R. J. Kryter, Vice-Pres., Esterline-Angus Co., Indianapolis
B. H. Jeup, Chem. Engr., State Bd. Health, Indianapolis
Comdr. J. L. Leister, CEC—U.S.N. (R), Washington

Mr. Wm. A. Hanley, Chief Engineer of the Eli Lilly Co. of Indianapolis gave an address on the subject of **"Winning the War and the Problems of the Peace."** Recent reassuring information on the production of airplanes makes the winning of the war seem more certain, but the problems of the peace are many and large. Among the problems of the future are a tremendous national debt, bankruptcy for many foreign nations after the war, possible communism in France and Germany. But the greatest problem, according to Mr. Hanley, is the provision of jobs for the thirty million persons now in war work and military service, and how to return the working women to the home. Reduction of governmental bureaus by abolishment of many, solving the pension problem, and paying off the national debt will challenge our ingenuity in the future. In spite of the fact that the present lack of satisfaction of consumer demand will aid in the pro-

duction of jobs after the war, Mr. Hanley believes the biggest job of planning now concerns the provision of post-war employment, and he favors planning by private enterprise as opposed to governmental employment and handouts.

Friday Session

"Cement Lining of Pipe in Place" was the title of a paper presented by F. A. Schaefer, Water Supt., New Albany. This is the first project of lining mains by the Tate Process in Indiana and was decided upon after studies showed that rates of tuberculation increased with repeated main cleaning. The mechanism of the process is simple, depending on good planning, skilled labor, good engineering, and a knowledge of all valves and openings in the line to be rehabilitated.

A seven-foot section was cut from the pipe at the end of each block, the process being limited to working through a 700-foot span of line. Service is maintained by connecting all services to a by-pass, using rubber hose for temporary connections. Tools consist of rotating cutting knives, steel brushes and rubber squeegees. A cement-sand mixture is prepared and 20 per cent more than needed is added to the pipe, after which a special bullet nosed mandrel is inserted and slowly drawn through the pipe. The lining is 3/16 inch thick except on the bottom, where it is slightly thicker. The main is chlorinated after the cement lining sets and before house services are restored.

Some 6,000 feet were lined at New Albany by the process at an average cost of $1.31 per foot for 6 and 8 inch mains. Forty special fittings, 14 valves and 175 services were dug up and replaced after the treatment. Cost is dependent on the number of fittings, services and valves that have to be dug up, replaced and repaved. Mr. Schaefer considers the method successful, and although of rather high cost, eliminates recurring maintenance or cleaning costs. Mr. Schaefer also stressed the fact that the increased flow capacities from tuberculated mains so rehabilitated and protected are greater than can be obtained by any means except larger mains.

L. S. Finch, Prin. Asst. Engr. of the Indianapolis Water Co., who spoke on **"Distribution System Construction Records,"** believes that every water plant needs good records of construction, not only in war time but also in peace time. Several cases were cited to show the need for good maps and records to prevent waste in time, effort and money in case of repairs. Mr. Finch showed the type of records kept on hydrants and valves by the Indianapolis Water Co. A large map showing the location of every valve, hydrant, and special fitting is also kept, with smaller maps showing enlarged sections. Notations on the map show the date of installation and other pertinent information such as whether a valve is right or left handed.

(1) (2) (3) (4)

(1) *"Kokomo-Bill" Birch learns the Fire Underwriters' knot from Prof. C. H. Lawshe.*
(2) *"Jim" Brown, National Water Main Cleaning Co.; Jo Davidson, Reilly Tar & Chem. Co., Indianapolis; Larry Lingnor,* WATER WORKS & SEWERAGE, *Chicago.*
(3) *Carl Brown, U. S. Pipe Co., Chicago, and Tom Storms, R. D. Wood Co., Chicago.*
(4) *The Laux-Nickel Test—J. B. Nickel, Tennessee Corp., Atlanta, Ga., and Paul Laux, City Chemist, Anderson, Ind.*

The Sea Bees

In the absence of Lt. Comdr. Brahtz, who was scheduled to speak on Pearl Harbor, Comdr. J. L. Leister, CEC, USN(R), told about the work of the Civil Engineer Corps in the U. S. Navy and the organization known as the "Sea Bees" (C. Bs.) or Construction Battalions. These battalions are not used in continental United States but work entirely in the construction of Navy bases and airfields in foreign waters and lands. Sixty per cent of the personnel have petty officer ratings and 10 per cent are C. P. O.'s, indicating the highly skilled men in the organization. Fifty-seven trades are included in each battalion of 1,100 men, and these men must not only be skilled in a trade but also be ready to fight. Two schools exist for training the "Sea Bees" and training periods are 16 and 12 weeks. Comdr. Leister told of several cases of heroism not only in the battalion that landed with the Marines at Guadalcanal, but elsewhere. These men have come to be known as the "Can Do Boys," and after the war it will be a fine recommendation for any man to be able to point to "C. B." service during World War II.

Manufacturers' Representatives

C. C. Jeff Abplanalp
Wallace & Tiernan
Chicago

Burke Burt
National Mach. Co.
Chicago

Mrs. Paul Frame
Ulrich Chem. Co,
Indianapolis

Col. Richard Lieber, Chairman of the National Conference on State Parks, Indianapolis, was scheduled to talk on **"Conservation of Life and Property in War Time,"** but really gave an excellent discourse on why we should fight against poor planning and the waste of natural resources. Forthright, witty, philosophical, slightly sarcastic at times but never dull, Col. Lieber talked on such points as the waste of natural gas in Indiana and how lack of metering of water supplies might result in a similar depletion of a natural resource. (See comment on recession of Indiana Water Table in the early part of this report.) Robbing the ground water for the cooling of theaters, lack of protection for water supplies, particularly artificial reservoirs used for pleasure or receiving sanitary wastes from summer cottages on its shores, and the logic of sewer rentals all came in for a share in the comments of the speaker. "The Ohio River," said Col. Lieber, "has four functions—it is a sewer, a source of drinking water, a highway, and a flood outlet." At Cincinnati, 25 per cent of the minimal flow is sewage.

Regarding war time protection, the speaker pointed out that the cities were most vulnerable inasmuch as 47,000,000 persons reside on only 2.2 per cent of the area of the United States. The solution to our problems is for us to watch our resources from which we live and

not let "George" (referring to the government bureaus) do it. The people themselves must watch their resources. "That which our government must do for us because we are lazy, it will be compelled to do to us," concluded Col. Lieber.

War Gases and Water Supplies

Mr. R. J. Kryter, Vice Pres., Esterline-Angus Co., Indianapolis, gave an excellent talk on **"War Gases,"** telling of the history, objectives of use, classification, and important examples. As to the effect of these gases on water supplies, the speaker said, in the first place the quantity that could be put into a water supply was so small in comparison to the volume of water as to be insignificant; in the second place, these organic gases hydrolyze and lose their toxicity or will with ordinary water treatment, and in the third place, only the arsenicals leave a residue that is poisonous. Tests for arsenic can be easily made. A blanket of gas 25 feet deep would require 50-60 tons per square mile to be effective. Gas from this concentration over any water reservoir would be insignificant. Even 1,000 pounds of arsenical gas in 50,000,000 gallons of water would represent so little arsenic per capita that a person would have to drink 200 gallons to obtain a lethal dose. The biggest problem of water works men in this regard is to explain to the layman that he need have no fears regarding the poisoning of whole populations by gas contamination of the water supply and that the addition of deadly bacteria to a water supply is certainly impractical if not fantastic, inasmuch as a water plant is designed and operated for the purpose of removing bacteria.

New Officers

At the luncheon on Friday noon, the nominating committee presented the following slate of officers:

Chairman
H. W. Neimeyer, Indianapolis.

Vice Chairman
Clarence Adams, New Albany.

Secretary-Treasurer
Charles Bechert, Indianapolis.

Assistant Secretary
Leo Louis, Indianapolis.

Director, A. W. W. A.
M. H. Schwartz, Vincennes.

Following the unanimous passage of this slate, the meeting was addressed by Harry Jordan, Secy. of A. W. W. A., who spoke on "The Three M's—Manpower, Materials, and Mutual Aid." Mr. Jordan commented on the British system of either using a man's skill in the military service or detaching him for service on the home production front. Such has not been the case here, and water works men have been confused, with the result that many have gone into service, leaving the country short of experienced men in the field. Now that there is a Procurement Committee in the War Manpower Commission, any person thinking of joining up should reserve action until the committee puts the finger on him and tells him where to go or stay.

In regard to materials, Jordan spoke again of the fact that water works men had practically eliminated buying supplies for repairs in 1942 out of patriotic fervor. The result has left them without the possibility to buy sufficient supplies now under the new U-1 order. If a plant needs materials above its present limit, the superintendent should say so in no uncertain terms, for it is just short of criminal to allow a water system to deteriorate. Another reason that many water works men did not buy supplies in 1942 was because the priority rating allowed water plants would not obtain the needed materials.

On the subject of Mutual Aid, Mr. Jordan complained that the W. P. B. had not yet made up its mind what to do with the finest bit of cooperative organizing that had yet come to light. "W. P. B. or no, O. C. D. or no, war or no war, Mutual Aid seems here to stay."

Attendance at the meetings was good, and in spite of rationing, nearly 150 persons were fed at each meal. With a membership of only 185 and an attendance of over 200, it is evident that the Indiana Section meetings are popular. The ability of the boys to take 17 speakers and a movie in two days is further evidence of this interest, but your reporter noticed that with so many papers and the sessions starting late, it was impossible to put questions to a speaker or discuss papers—a situation which detracts from such meetings and leaves many unanswered questions in the minds of those attending.

Western Section N.Y.S.S.W.A. Meets in Cheektowaga

The town of Cheektowaga was host to the Western Section of the N.Y.S.S.W.A. on April 24. Forty persons, including five guests, attended the meeting which was held at the Trap and Field Club.

Group at Cheektowaga Plant
Elmer Mesner, Plant Supt. (right), Conducting Inspection.

Mr. Murphy of the Westinghouse Co. gave a talk on the maintenance, inspection and care of electrical equipment. After lunch the meeting adjourned to the Cheektowaga sewage plant for an inspection of the improvements to the plant. Newell L. Nussbaumer, designer, and Elmer Mesner, Supt., conducted the tour.

George F. Fynn Named Successor to Dr. Symons at Buffalo, N. Y.

George F. Fynn
Chief Chemist, Buffalo Sewer Authority

Mr. George F. Fynn, formerly statistician of the Buffalo Sewer Authority, was named to fill the vacancy in the position of Chief Chemist, when Dr. George E. Symons resigned to become Associate Editor of WATER WORKS AND SEWERAGE. Mr. Fynn has an A.B. degree from Holy Cross College and a B.S. degree in chemical engineering from Massachusetts Institute of Technology. Mr. Fynn was technical supervisor for the National Aniline & Chemical Co. in Buffalo in 1923-24 and later technical research and sales engineer for the G. H. Gautier Co. of Jersey City, and departmental manager of purchases and sales for the George L. Claflin Co. of Providence, R. I.

For the past four and one-half years Mr. Fynn has been statistician for the Sewer Authority in which capacity he was closely identified with the laboratory work in the tabulation and compilation of the data as well as assisting in the preparation of the operating reports. Mr. Fynn is co-author with Dr. Symons of a paper on the development of record forms for laboratory and operating data in a sewage treatment works.

IS THE CLEVELAND CONFERENCE ON YOUR CALENDAR?

If Not, Better Read What Second A.W.W.A. Wartime Meeting Has to Offer the Water Works Profession

THE above three questions, which deserve the emphasis given, came from A. W. W. A. headquarters in the publicity folder on the "Conference on War Winning Water Works Operation" to be held in Cleveland, Ohio, June 15-16-17-18. Although all A. W. W. A. members have received this folder, we believe that repetition is justified. To those who have not seen them before, they are worth studying. More important, the Cleveland Conference is well worth coming to. Yes, even more so than Secretary Jordan knew when the mailing piece was prepared. As much is revealed in the latest release on the program which has just been produced.

The time to be occupied by the Conference has had to be extended through Friday forenoon, June 18, and begins at noon on Tuesday the 15th, in order to effectively cover all of the topics which the growth of the technical program indicated the importance of.

Cleveland was chosen as the meeting place because of its central location and convenience to high percent of A. W. W. A. members and other water works men in America. This much is revealed by the accompanying map showing the great population which is to be found within the 500 mile travel radius.

Because of the anticipated attendance it became necessary to choose two hotels as co-headquarters hotels—The Statler and The Carter—which the accompanying map of Cleveland reveals are but a stone's throw of each other, while several other hotels are close to both. Exhibits and registration are being arranged at Hotel Statler; the President's Reception and Dance on Tuesday evening and the Annual Dinner and Dance are to be held in Hotel Carter, so "you pay your money and take your choice," as the saying goes. The rates are practically identical.

The full Technical Program was printed in our April issue and will not be repeated here. Some of the highlights follow.

Is there any water works man in America today who knows all the answers—even about his job and his industry? Of course not.

On the contrary, is it not true that many water works men wish to inform themselves as fully as possible so that they can do their work better? Surely!

What water works man is there who will not be able to meet wartime needs of his community better by spending a few days at the Conference in Cleveland?

Reader—answer that yourself!

Three Distinguished Guest Speakers

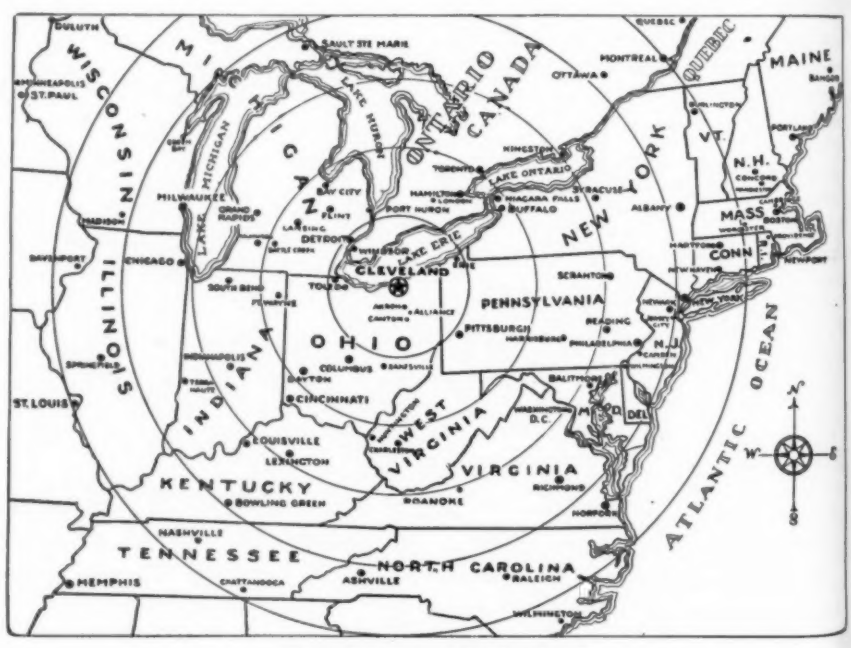
Since the printing of the program in its preliminary form in April three distinguished guest speakers have been secured in addition to an unusually high level of member participation in the several sessions.

W.P.B.'s Krug

The session on the morning of June 16 will bring again to the A. W. W. A. platform **J. A. Krug,** now Director of War Utilities and Vice-Chairman of the War Production Board. As third ranking member of the W. P. B., he is in charge of Materials Requirements and the Controlled Materials System. Thus he occupies a key position in the distribution of all basic raw materials whether they go into direct military, governmental or civilian use.

From Chief of the Power Branch he has risen also to the post of Director of War Utilities and in that capacity administers the policies of the W. P. B. as they relate to Water, Gas, Central Heating, Electricity and Telephone and Telegraph.

Those who know Director Krug and have seen him in action pay tribute to his capacity to go to the heart of important problems and to find answers that stand the test in the turbulent Washington scene. He



Centrally Located Cleveland

(The circles represent 100 miles each. All territory within the outermost circle is less than 500 miles of the Conference city.)

will in 1943 renew his acquaintance with the A. W. W. A., and, as he did a year ago, will tell water works men just how to fit into the overall wartime situation.

In the same session, **Arthur Gorman,** long time member and active worker in the A. W. W. A., now chief of the Water Branch of the Office of War Utilities, will discuss in detail the policies of the War Production Board in controlling public water supply construction, maintenance and operation. Also **A. M. Rawn,** chief of the recently established Sewerage and Sanitation Section in the Government Division, has been invited to participate for the benefit of those members interested in sewerage.

England's Collins

On the morning of June 17, a distinguished British municipal administrator, **Arthur Collins,** will speak on "War's Effect on English Local Government." Mr. Collins is an internationally known expert on municipal finance and administration who is being brought to North America by the "British Information Services" to speak before a few selected gatherings of municipal finance officers and municipal utility administrators.

Mr. Collins will bring to the A. W. W. A. Conference an account of war's effect upon utility and municipal finance in England. Much has been said about the physical effect of bombing but little about what war can do to the budget of a water department or a city.

Monsanto's Irwin

Labor relations will also be broadly discussed by **James W. Irwin,** Assistant to the President of the Monsanto Chemical Company. The problems of water departments in this field have been growing in recent years and a better understanding in the legal background of employee organization is timely. Mr. Irwin's extensive experience in personnel and labor relations makes his message at the A. W. W. A. Conference especially valuable.

Following the address of Mr. Irwin, there will be a panel discussion on the subject in which Alfke of Hackensack Water Co., Byrne and Van Dusen of the Omaha Utilities District, and Eberling of Cincinnati Water Department will participate.

In the same session **Philip B. Niles** of the American Water Works & Electric Co. will discuss the current personnel problems related to military service on the one hand and industrial competition with public utility employment on the other hand.

The Office of Civilian Defense will use the A. W. W. A. Conference as the occasion to bring together all its regional Sanitary Engineers. A two day conference will be held beginning Monday, June 14, during which the problems of the O. C. D. engineering personnel will be thoroughly studied. And at the opening General Session of the A. W. W. A. on the morning of Wednesday, June 16, a senior officer of the O. C. D. will deliver an address on the Relation of the Office of Civilian Defense to Public Water Supply.

A Superintendent's Prize Session

A feature of the 1943 Conference will be the Superintendents' Prize Session made possible through the generosity of a number of superintendents.

One session of the Plant Management Division will be devoted to the presentation of the five prize winning papers submitted by superintendents or plant managers of water departments or companies on the topic, **"How the Water Utility Met Wartime Emergency Conditions in Our Town."**

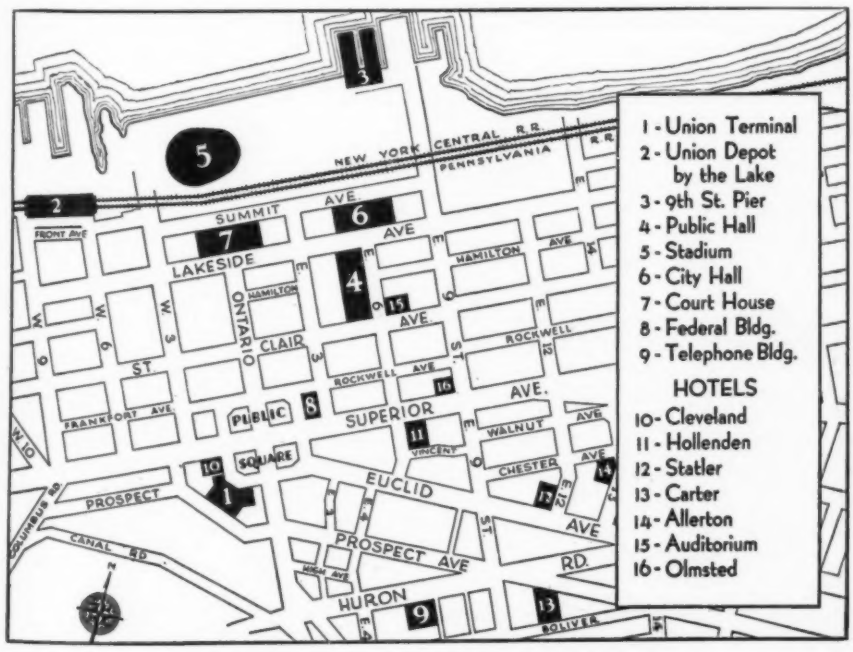
The prizes awarded will be in cash amounts of $50, $40, $30, $20 and $10, and this session alone should justify the trip to Cleveland by superintendents and plant managers.

Racketeering Tank Repair Outfits

Also not shown on the published draft of the program is the scheduled discussion of ways and means of dealing with the outfits who have been perpetrating a racket in the tank repair field by securing contracts on a low base price and running up the cost to enormous figures by removing and replacing allegedly weakened rivets which have been shown not to have more than the heads slightly pitted.

Large Number of Exhibitors

Interesting and surprising to many, the available exhibit space in Hotel Statler has long since been completely sold out and a waiting list for space exists.



Downtown Cleveland, Showing Hotel Locations

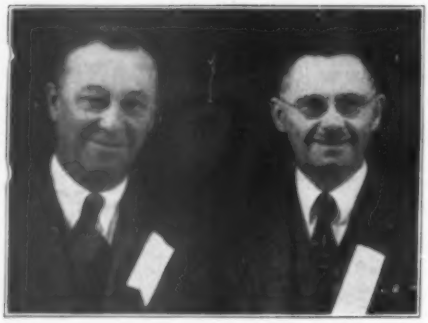
James C. Rickey, Illustrious Hydraulic Engineer, Dies

James W. Rickey, former chief hydraulic engineer of the Aluminum Co. of America, died last month in Washington, D. C., at the age of 71.

Mr. Rickey was born in Dayton, Ohio, and educated at Rensselaer Polytechnic Institute where he was graduated in 1894. From 1897 to 1907 he was principal assistant engineer for the St. Anthony Falls Power Co. and the Minneapolis Mill Co. He joined the Aluminum Co. of America in 1907 as chief hydraulic engineer and for the next thirty years designed and supervised construction of all of the company's dams and many of its hydroelectric developments.

OHIO SECTION HOLDS SUCCESSFUL ONE DAY MEETING

A Report
By GEORGE E. SYMONS
Associate Editor



New and Retiring Chairmen

Harvey P. Jones
Cons. Engr.
Toledo, O.

E. E. Smith
Supt., Water
Lima, O.

SPEAKING before 119 luncheon guests at the Ohio Section meeting in Mansfield on April 12th, Harry Jordan gave meaning to the Latin phrase "Quo Vadis" by translating it into good American idiom, to wit, "Where the hell do you think you're going?"

A.W.W.A., Jordan said, is still going forward in membership, both civilian and military, and now has 4546 members, with the California section first, followed by New York, Canada, and Illinois in that order, with the latter pressing for third place. (Ohio gained eight new members at the meeting in response to the energetic efforts of Hayes Kuhns, membership chairman, and now has more than 200 in the section.—Ed.)

Where the A.W.W.A. is going with respect to the Cleveland meeting was outlined briefly. The meeting is to be streamlined (with no extracurricular activities), beginning Tuesday afternoon, June 15, and continuing until Friday noon. The program is to include such outstanding speakers as Col. Willard Chevalier, Editor of Business Week, and Dr. Abel Wolman, Pres. of the Water Works Assoc., both of whom will speak in a Special Session on how the water works fits into the post-war picture. Mr. Jordan expects the program to be a natural, complete with a free-for-all discussion on Specifications for Tar Dipped Cast Iron Pipe, and the problem and implications of the introduction of fluorides into water for dental health purposes. (The preliminary program of the meeting appeared in the April issue of WATER WORKS AND SEWERAGE.)

Where we are going with the manpower problem was also commented on by the speaker. Water works superintendents should make up a summary sheet showing the service liability status of all employees; although we are an essential industry, it behooves us to consider the facts of the manpower situation and realize that we can not hold our organizations intact. For employees who are considered as key men, superintendents should file form 42a or 42b and follow this up with an appeal if necessary. Count on replacing some men with women. "Girl meter readers are just as good as men and when put in an attractive uniform contribute markedly to good public relations."

Mr. Jordan closed with some comment regarding where we are going in the post-war picture, with particular reference to the gain in working hours per man week, the gain in personnel income per man week, and the expected effect when these are adjusted after the war. There are two schools of thought with respect to how these problems will be met. One believes in the introduction of public funds (possibly 24 billion dollars a year) into the durable goods field. The other believes in capital nest-egging by private industry to take care of post-war building. Mr. Jordan concluded that with complete dispassionate feeliug one can see, in this difference of opinion, political fodder for the next presidential campaign.

Fuller Award
Charles P. Hoover
Supt., Filtration
Columbus, O.

A.W.W.A. Director
W. W. Morehouse
Director of Water
Dayton, O.

Business Meeting

At the end of the usual committee reports, resolutions were read thanking the city, the officers, and the participants for the success of the meeting. A resolution of sympathy was adopted expressing sorrow and regret at the recent passing of Mr. Clarence Bahlmann, Water Purification Supervisor of the Cincinnati Water Works.

Trustees

Hayes R. Kuhns
The Leadite Co.
Killbuck, O.

Ira M. Hoover
Supt. Water
Montpelier, O.
(Programmer)

By unanimous ballot the meeting accepted the slate of officers presented by the nominating committee as follows:

Chairman—Harvey P. Jones, Toledo.

Acting Vice-Chairman — Carl A. Eberling, Cincinnati.

Trustee—Hayes Kuhns, Killbuck.

Acting Trustee — Ira Hoover, Montpelier.

Honorary Trustee — Paul Cook, U.S.N.

Secretary-Treasurer—L. J. Hoffman, Akron.

(Mr. Cook is now serving in the United States Navy and the acting positions were established to fill the vacancy, inasmuch as he would have been nominated for vice-chairman.)

Retiring Chairman Smith (Lima) becomes Trustee and holdover Trustees are L. T. Fawcett, Youngstown, and W. W. Morehouse, Dayton.

W. W. Morehouse, Dayton, Chairman of the Fuller Award Committee, announced the selection of Mr. Charles P. Hoover, of Columbus, to receive the Award "for outstanding service in the field of water purification and softening, and his unselfish assistance to water works men, not only in Ohio but throughout the nation for a period of thirty years."

Nelson Answers Questions

True to form exhibited at other meetings, H. Lloyd Nelson, Principal Engineer, Office of War Utilities, W.P.B., answered innumerable questions on "Operation of the Water

Principal Speakers

H. Lloyd Nelson, W.B.P., Washington, D. C. — *Harry E. Jordan, Secy., AWWA, New York*

Utility in Conjunction with the Office of War Utilities Preference Order U-1." Although speaking officially, Mr. Nelson said he could not be quoted directly. Addenda are being issued to Order U-1 and the whole order is in the process of revision, but this reporter believes that certain ideas gleaned from Mr. Nelson's comments should receive some comment.

Whereas under M.R.O. capital expenditures are limited to $1500 underground and $500 above ground, there is no restriction on purchase of materials from other utilities through the mutual aid plan. There is no limit on amounts to be spent on individual jobs so long as the total amount spent in any quarter is within the limit for that period. Victory gardens can be serviced to the extent of 5000 sq. ft. with certain restrictions and limitations. At the present time there is nothing definite on the question of accepting valves and hydrants from another utility when the size and style are not those in use at the buyer's plant. Efforts are being made to have the Chairman of the Inventory Control Section allow the purchase of one's own type of equipment if it can not be obtained from another utility.

Copper pipe can not be used for anything *but repair*. If one wishes information on the priority status of certain materials or equipment, he should contact the manufacturer of that equipment for the latest information. And for persons who did not purchase any materials in the last nine months of 1942, it is possible to write a letter to W.P.B. explaining the case and the fact that such materials are needed now.

Mr. Nelson's remarks and answers were so well appreciated that a resolution of thanks was voted him.

Trustees

F. P. Fischer, Wallace & Tiernan, Cleveland, O. — *L. T. Fawcett, Secy. & Gen. Mgr., Mahoning Valley San. Dist.*

Morning Technical Session

The meeting was opened in the morning by Chairman E. E. Smith of Lima, with the appointment of committees and the introduction of the first speaker, O. C. Kalbfleisch, Supt. of Water in Mansfield.

Mr. Kalbfleisch spoke briefly on the **"General Improvements to Mansfield's Water Works"**; of the history of the water supply; of how the reservoirs were constructed 20 years ago when the well supply had dwindled in capacity from 3.5 m.g.d. to 50,000 g.p.d. The speaker also told about the decrease in pump capacity from 3.6 m.g.d. to 2.6 m.g.d. due to leaking rings. When these were repaired the volume was restored, whereas cleaning of the wells had had no effect on total flow. Bleeding of dead ends in the winter has markedly reduced the cost of repairs to frozen lines. Other improvements and repairs reduced the cost of operation from $104 per m.g. to approximately $20 per m.g. In reply to a question Mr. Kalbfleisch stated that although the population of the city was 38,000, the actual population served was 45,000, with an average pumpage of 4.5 m.g.d. Ten pounds of chlorine and 2-3 pounds of ammonia are used daily.

Ohio Salt Men

H. M. Olson, Pittsburgh, Pa. — *W. A. Frye, Cleveland, O.*

"Plant Expansion Problems of Shelby" were described by J. P. Adkins, Manager of Public Utilities. The Shelby water supply was instituted in 1897 when the 12 or 15 cisterns were supplanted by wells and a distribution system of 10 miles of pipe with 100 fire hydrants. A new franchise was granted the company in 1917, at which time iron removal, a settling basin, and filters were installed. Two wells, 15 and 36 ft. in diameter and 38 ft. deep, depend on a water table supplied by a drainage area of only twenty square miles.

Programmers

O. C. Kalbfleisch, Supt. of Water, Mansfield, O. — *J. P. Adkins, Mgr. Pub. Utilities, Shelby, O.*

In 1934 the city bought the plant and three years later installed a softening plant which reduces the hardness from 39 grains to 7-9 grains and removes the 8 parts per million of iron which acts as a coagulant. At the same time other improvements were made including main cleaning, elimination of all dead ends, and erection of a standpipe and elevated tank. Cost of treatment is approximately $60 per million gallons, but treatment has eliminated many operating problems and reduced the repair of meters. With a pumpage of 1,250,000 gallons per day the wells are going dry and plans are under way for the utilization of a surface supply.

In typical Ira Hoover style, Ira Hoover told about **"Water Works Experiences at Montpelier."** "Montpelier," said Hoover, "is a town of 3800, the location of which can not possibly be known to any one but consulting engineers, and salesmen who have the best lines of curb cocks, chlorine, paint, and miscellaneous paper products." It was here in 1940 that water softening was installed after nineteen years of talk. Prior to water softening, chlorination had been placed in operation at the request of the De-

Familiar Faces

Maj. F. W. Jones, Cleveland (Sr. Engr., 5th Service Com.) — *Tom B. Henry, H. P. Jones Co., Toledo, O.*

partment of Health, "and a good thing, too, for two years later a well sprung a casing leak, allowing the entrance of surface water."

The average citizen in Montpelier

John Gettrust
Supt. Water Purification & Pumping

Wendell R. La Due
Ch. Engr. & Supt. Bur. Water & Sewerage

Akronites

was concerned more with the 3 p.p.m. of iron and 330 p.p.m. of hardness than he was with the bacteriological quality of the water, but even so, the promotion of the new plant was slow. Contributing to this promotion, quite by accident, and strictly by word of mouth, was the opinion of a railroad doctor who told a patient that, "Montpelier, with its hard water, sends more gallstone cases to this [railroad] hospital than any other community." "People began to talk soft water after that story got around."

Hoover also expressed the opinion that the Ohio Water Works Conferences formerly held under the auspices of the State Department of Health had been helpful to him in the promotion of the new water treatment plant in Montpelier, and he decried the decision to abandon these conferences which had been so helpful to the small plant operator.

The Montpelier plant was designed by H. P. Jones of Toledo, and consists essentially of two Permutit precipitators, of 750,000 g.p.d. each, with a clear well capacity of 250,000 gallons, standpipe, and all other appurtenances to maintain a well operated softening plant. Operating with one man on an eight hour day, the water is reduced in hardness to approximately 80 p.p.m. for approximately $17-18 per million gallons. The high service pumping from the clear well to the standpipe is controlled at the municipal light plant. This doubling up saves in operating costs.

Hoover also described an experiment on cathodic protection of the iron in his filter troughs. Using an applied current of 30 volts and 350 milliamps, protection was afforded from rusting as indicated by a steel rod immersed in the water above the sand. A rod immersed in a filter not so protected showed severe corrosion.

L. J. Hoffman
Off. Mgr. Bur. Water Akron
(Secretary)

D. P. Griffin
Dist. Engr. State Dept. of Health Mansfield
(Round Tabler)

Problems of the Small Water Utility
(A Round Table)

Echoing the sentiments of Ira Hoover, Chairman Smith said that he too regretted the discontinuance of the Ohio Water Conference and that whereas A.W.W.A. could not take the place of these conferences, it was proposed to hold a round table discussion at this meeting.

Mr. D. P. Griffin, Dist. Engr. of the State Dept. of Health, began the discussion by telling about the districting of the state in the last year, and how a survey had been made of all the water supplies. As to the problems of "the small fellow" Griffin said the obtaining of equipment and material was particularly bothersome. "There are some places where one 10-foot length of pipe, one valve and one sleeve connection constitute the inventory of the plant," said Griffin. Type of water is a problem in some instances and the speaker cited an example of the village of Lucas, where corrosive water treatment facilities were installed but not used, with the result that all steel pipe had to be replaced with cast iron.

On the matter of well protection, Mr. Griffin said that it had been found advisable to give drilled wells surface protection from pollution to a distance of 300 ft. radially. Emergency chlorination has had to be used where such wells have not received adequate protection.

Mr. Specht, of Orrville, asked about the reasons for water heaters plugging with magnesium silicate even though the water is softened. Scale appears worse than before softening. Calgon is used but not recarbonation. Charles P. Hoover, of Columbus, replied that excess lime should be used to remove all of the magnesium, followed by recarbonation. Calgon will not sequester magnesium—i.e. not prevent precipitation.

Mr. Crawford, of Plymouth, told

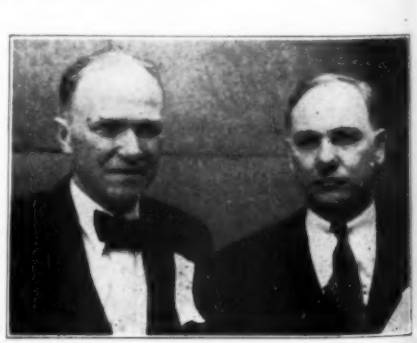
M. F. Hoffman
Commercial Supt. Cincinnati, O.

Leo Flotron
Engr. Bur. of Water, Akron

of how the gravel in his zeolite filters was caking and channelling, making it necessary to relay the bed at intervals of a few years. When questioned by Mr. Hoover, Crawford admitted that aeration was used to remove iron and that the pH increased during the process. Hoover replied that the water was undoubtedly unstable with respect to carbonate and this instability resulted in the deposition of calcium carbonate on the gravel. "More good well water is ruined by aeration," said Mr. Hoover, "than by any other treatment," and Mr. John Gettrust, of Akron, agreed.

Mr. T. R. Lathrop, Asst. Engr. of the Ohio Dept. of Health, commented briefly on the papers and the manpower problem, particularly in the smaller communities. Lathrop also cited the leak in the well casing described by Hoover at Montpelier as the reason the Dept. of Health objects to the use of wells located within a city.

An old friend and member of the section was introduced in a new uniform. Maj. Frank Woodbury Jones, U.S.P.H.S. (R.), of Cleveland and Sanitary Engineer for the Fifth Service Command.



Thos. R. Lathrop
Asst. Engr. State Dept. of Health

Ray Erwin
Supt. of Water Milford, O.
(Resolutions Com.)

SLUDGE AS FERTILIZER IN THE WAR EMERGENCY

Its Place and Use in Victory Gardening

By LE ROY W. VAN KLEECK
Senior Sanitary Engineer
CONNECTICUT STATE DEPT. OF HEALTH
HARTFORD, CONN.

The Author

Here is a most timely discussion of the use of sewage sludge as a soil improver and fertilizer supplement during this period of war economy and scarcity of nitrogenous substances for fertilizers while the nation is making an effort to increase food production through Victory Gardens.

Originally this discussion appeared in the form of a special bulletin produced for state-wide distribution by the Connecticut State Department of Health, having been prepared by Mr. Van Kleeck for that express purpose.

Probably as a result of the editorial "Sludge for Victory Gardens" in our March issue advocating the greatest possible use of sludges at this time for Victory Gardens, we have heard from readers that in some instances local physicians are decrying the use of sludge on the basis of such use constituting a health hazard.

On the above score we consider it a real privilege to be able to reproduce this discussion of the values and adaptations of digested sewage sludges and their safety when properly applied to vegetable gardens — particularly so since the discussion and recommendations takes the form of an official statement by an important State Health Department.

THE war makes it imperative that full use be made of all of our natural resources. For this reason the State Department of Health of Connecticut discusses the use of sewage sludge for fertilizing lawns, flower gardens and food crops.

Only Digested Sludge Recommended

When raw sewage solids are settled in tanks at sewage plants and stored under controlled conditions in special tanks called "digesters" (either heated or unheated) for considerable periods, it is called digested. The digestion of sludge involves a bio-chemical process in which the organic matter remaining in the sludge is in a more stable form. Whereas raw sludge is generally brown in color, lumpy, watery, and has an offensive odor, digested sludge is black in color, homogeneous, has the consistency of thinned molasses, and gives off a tarry or gassy odor which is not offensive. Raw sludge is odorous, has a high grease content, tends to make soils acid, is a potential carrier of pathogenic bacteria, and is not humified for soil use. *The use of raw sludge in any form is not recommended.*

Liquid digested sludge contains from 85 to 98 per cent water and is rarely used as a fertilizer. Principal objections are, first, the large quantity of fluid bulk that must be transported; secondly, the difficulties of application to the area to be fertilized; and, thirdly, the greater likelihood of objectionable odor. Instead, sludge is generally utilized following partial dewatering by draining it on beds of sand, pressing, centrifuging or vacuum filtration. The partially dried sludge is then referred to as "sludge cake," and ordinarily contains 70 per cent or less of moisture. Such cake is dry enough to be shoveled and spread like manure or moist soil.

Fertilizing Value of Digested Sewage Sludge

A comparison based on chemical analysis of digested primary sludge and related materials as reported by various investigators is afforded in the accompanying table.

It will be noted that digested sewage sludge compares favorably with the ordinary run of manures. Its principal deficiency is in potash. The nitrogen in sludge has been shown to be available over a long period (generally at least two years) and there is, therefore, no danger of so-called burning of crops.

The chemical analysis of sludge does not, however, tell the entire story. Primary digested sludge has its greatest use as a soil conditioner, constituting as it does a valuable source of humus. Generally, about 50 per cent of the dry weight of sludge is humus. Sludge is not a complete food for plants as commercial fertilizers are and cannot be expected to serve as an all-purpose plant food. It should be supplemented by the use of commercial fertilizers. Its application, however, has a favorable effect on soil structure. Soils repeatedly planted to growing crops require the organic humus present in manures, peat moss, green cover crops, and sludges. In addition, sludge contains soil improving and growth promoting values by replenishment of organic matter and because the minor elements it contains are needed by plants.

Another significant point, not revealed in the chemical analysis of digested sludges, is the comparative freedom of such sludges from weed seeds which are largely destroyed in the digestion process. On the other hand, most manures, unless well rotted, contain numbers of weed seeds which prove very objectionable, particularly when they are spread on lawns. Tomato seeds and a few of the cucurbits will sprout in sludge, but they are not ordinarily troublesome.

When used continuously on land, sludge not conditioned with lime

TYPICAL CHEMICAL ANALYSES OF SEWAGE SLUDGE, MANURES, AND COMMERCIAL FERTILIZERS

	Total Nitrogen % (Dry Basis)	Total Phosphoric Acid % (Dry Basis)	Total Potash % (Dry Basis)
Digested Sludge (Average of samples from a number of sewage plants in Connecticut)	1.7	1.5	0.15
Horse Manure	2.2	1.10	1.6
Sheep Manure	1.8	1.52	3.0
Poultry Manure	3.6	3.5	1.9
Common Garden Commercial Fertilizer	4.0	9.0	10.0

tends to acidify the soil. Hence, corrective measures must be taken every three or four years to avoid damage to plants requiring a neutral or near neutral soil by checking acidity, caused largely by the breakdown of the greases and fats present in sludge. Judicious applications of ground limestone or hydrated lime will correct such acidity.

Methods of Applying Digested Sludge and Hygienic Considerations

Sludge may be applied as a top dressing in the case of trees or lawns; in the hill in the case of melons, squash, or other vine crops; or spread, then plowed or spaded into the soil. When used as a top dressing, it should not be applied too thickly, especially on lawns, or it may choke the growing vegetation. Recommended amounts are listed in an accompanying table. Sludge may be applied when the ground is frozen or covered with snow. In such cases it is raked and pulverized into the soil in the spring. Grinding sludge cake with machines greatly enhances its application as a top dressing. Except where applied to grass, trees, shrubs or perennial beds, sludge should be placed in the hill or plowed under in the fall or early spring before planting the crop.

Digester sludge is safe from the health standpoint if mixed with the soil and not applied to the growing crop. It is safer not to plant root crops eaten raw (examples, carrot or radish) or vegetables grown in close contact with the soil and eaten raw (examples, lettuce, celery, onions) in ground recently fertilized with sewage sludge.

The digestion of sludge, together with the commoner methods of dewatering such as air-drying or vacuum filtration (in which case most sludges are conditioned with lime, giving a high enough pH to kill great numbers of bacteria), afford sufficient protection against intestinal diseases. It is also desirable, of course, to use reasonable care in handling it. A special committee of the Federation of Sewage Works Associations reporting on the "Utilization of Sludge as a Fertilizer" states: "The committee knows of no case of sickness traceable to the use of digested sludge or activated sludge." (In the latter case the sludge has been subjected to heat drying which effects post irrigation along with the drying.)

Amount of Digested Sludge to Use

While an excess of sludge will rarely do harm, except in cases of outright mechanical smothering of growing things, the following suggestions for its application have been made by various investigators:

For orchards—16 tons sludge cake per acre (or about 11 cu. yds. per acre).

For grass—10-20 cu. yds. per acre (or 0.6 to 1¼ cu. ft. per 100 sq. ft of soil).

For vegetables, shrubs and flowers—20-60 cu. yds. per acre (or 1¼ to 3¾ cu. ft. per 100 sq. ft of soil).

Fortifying Digested Sludge

Fortifying sludge with chemicals will increase its total food constituents and hence its value. Such sludge should be applied in smaller amounts, depending on the type of crop and the local soil conditions. We understand from commercial fertilizer distributors that a 3-8-7 formula will be available for home gardeners this year instead of a 5-8-7 formula ordinarily recommended for general use. This means a cut of 2 per cent in the total nitrogen. If the new formula is mixed in equal proportions with sludge (on a dry basis), it will result in a 2.4-4.8-3.6 mixture. Or the following formula can be used, this being suitable for general use on almost any crop or soil:

Digested Sludge (dry basis)	400 lbs.*
Ammonium sulphate†	60 lbs.
Acid phosphate (20%)	100 lbs.
Muriate of potash	40 lbs.

*400 lbs. of bone dry sludge amounts to about ½ ton of sludge cake as removed from the average sand drying bed or 1,300 lbs. of cake as removed from the average vacuum filter. Roughly ⅔ of a cu. yd. or about 20 cu. ft. Other formulae may be used for special cases or a particular soil.
†May not be available this year because of war conditions.

Use of Sludge as Fertilizer

Some of the uses of sludge have already been pointed out. It is particularly adapted to lawns. Sludge deepens the green color of grass and stimulates a luxurious growth. Its benefits seem noticeable for several years. It should be applied in the amounts given above late in March and again early in September.

The home owner may well use it for the flower garden. Here it provides a much needed humus for the hot summer months as well as supplying a moderate but long-yielding amount of nitrogen.

Its use is also indicated for trees and shrubs. Trees fertilized with sludge frequently have a healthier foliage, both in amount and color, and retain their leaves for a longer time in the fall than nearby unfertilized trees.

In the vegetable garden its uses have already been suggested. It has been found to be particularly beneficial for corn, potatoes, beans, spinach, asparagus, and all vine crops. With the scarcity of animal manure, the victory gardener might well turn to sludge for his humus needs, bearing in mind the safeguards discussed above. The cost of manure in his community may be used as a rough index of the value of local sludge. A charge of from 25 cents to $2 per cubic yard for unground sludge is frequently made at sewage plants. Sludge may be transported in truck bodies or bagged for hauling in smaller amounts by private car.

Why Digested Sludge Has Not Been More Widely Used as a Soil Conditioner

What are some of the reasons why digested sludge has not been used more extensively as a soil conditioner? Undoubtedly an aesthetic dislike to its use because of its origin and source, and the fear of producing offensive odors, are paramount in the minds of many laymen and agriculturists. Since properly digested and dried sludge, and heat-dried and ground raw activated sludge have been established as safe hygienically for application to the soil, there appears little room for argument from the health standpoint against use of such sludges. With regard to odor, many of the more common animal manures, including cow, pig and poultry wastes, have as much or more odor than sludge, especially if applied before they are thoroughly rotted or composted.

Another reason why sludge is not used is the lack of promotion of its use. In some cases this is no fault of the plant operating personnel, but is caused by a lack of time. The primary job of sewage treatment plant personnel is the protection of the public health and the prevention of nuisance from raw sewage, and not the manufacture or sale of fertilizer. Sludge disposal as fertilizer, when it involves salesmanship, storage facilities, grinding equipment, and in some cases bagging facilities, delivery and bookkeeping, is beyond the scope of many of the smaller treatment plants.

An objection to the use of sludge as a fertilizer is the lumpy or chunky physical form of much sludge cake, which makes it unsatisfactory for lawns, shrubs, and flower beds. Heat-drying or air drying and grinding produces a product much more suitable for general use.

WARTIME SUBSTITUTE MANHOLE COVERS AND FRAMES

By GEORGE E. SYMONS
Associate Editor

IRON has not yet been released from the Critical Materials list and there appears little likelihood that it will be available until this war is over. Under these circumstances the use of substitute manhole covers may be expected to increase to the extent where it may become widespread. What are these substitutes? How are they made or where may they be obtained?

Wood, concrete, and terra cotta have not only been suggested but have actually been developed and tried in several places. Use of these substitutes will save from 300 to 500 pounds of iron for each manhole, perhaps more. In cities where sewer construction must be continued, not only in spite of the war but actually because of its shifting of populations, the saving in iron will amount to a large tonnage. Likewise, in cities where over-enthusiastic salvage collectors have removed manhole covers, these substitute covers may be the solution to the problem.

Wood Covers

Wood manhole covers with concrete frames seem to have been used first by Los Angeles County, where they were designed and developed by Alfred Jones, county surveyor, and C. E. Arnold, chief deputy. The cover is made from laminated wood strips fashioned either in circular or hexagonal shape. Lumber required totals 63.3 board feet of No. 1 common Wolmanized or creosoted Douglas fir. The hexagonal cover is 37½ inches in overall diameter and 32½ inches between opposite faces. Faces are 18¾ inches. Two lifting slots (3x¾ inches) are set in 8 inches from the opposite corners. Plans call for nailing the 2-inch by 4-inch by 8-inch laminated strips with four 20 penny nails to a strip and running at least two ⅜-inch bolts through all members, countersinking both bolt ends. Where it is difficult to secure nails and bolts, it is pointed out that engineers can use wood dowels and waterproof glue.

The cost of the cover will vary according to the locality. Lumber yards in the Los Angeles area can make these covers at a low price because they can use short pieces of lumber normally discarded. When bound by nails and bolts, the cover weighs approximately 130 pounds; the glued-in dowel cover weighs slightly less.

Preservative treatment of the wood by a pressure-impregnation process in accordance with the American Wood Preservers' Association standards is specified because decay and termite attack at the edge of the unit would seriously reduce the safety and useful life of the cover. A clean treatment is preferred to an oil borne treatment because of lowered fire hazards and ease of handling.

Wear and splintering of the wood is reduced by setting the cover so that the laminated strips are at a 45-degree angle to the line of traffic and applying a thin coat of bitumin or emulsified asphalt (covered with dry sand or pea gravel) to the top surface of the wood cover, and keeping the surface of the cover flush with the roadway.

The frame uses 0.14 cubic yards of class "A" concrete. Two ¼-inch reinforcing rods are used in the concrete retainer, one in the upper and one in the lower section, inside the perimeter. About 24 feet of rod are required to permit overlapping the ends. The six sides of the cover are faced with ¼-inch plywood when pouring the concrete, to give ample space for expansion and contraction

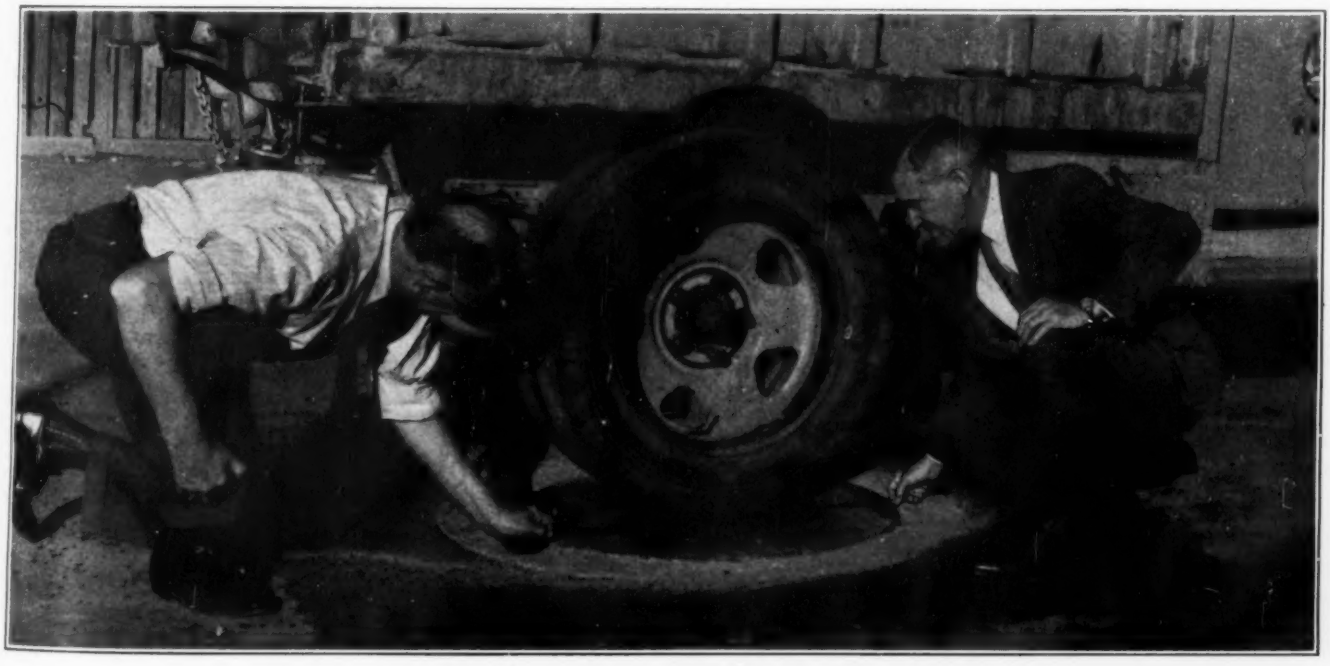


Fig. 1. The Truck Wheel Impact Test.
And the circular manhole cover of laminated wood proved that it could take it.

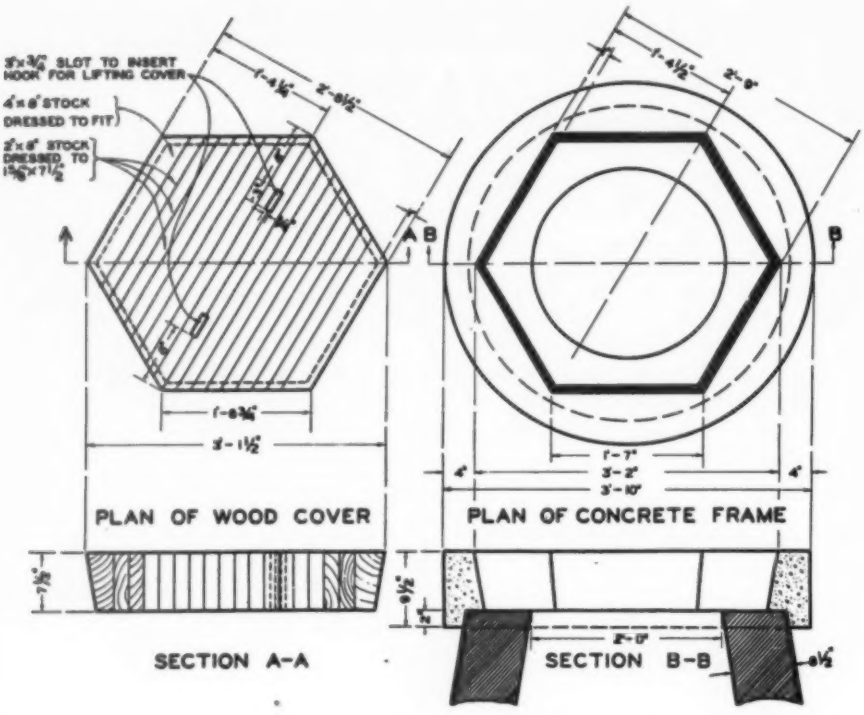


Fig. 2. Design of Hexagonal Wood Manhole Cover and Concrete Frame

between the cover and the retainer. Circular covers may be used as inside forms by tacking roofing paper to them to allow for ¼-inch clearance. Fig. 1 shows a circular manhole cover made of wood and Fig. 2 shows the design of a hexagonal wood cover and its concrete frame.

In an experimental test of one of these substitute covers, a 12-ton truck was driven over the cover. This was followed by a 10-ton steam roller. One wheel of the truck was then suspended 5 inches above the cover and dropped suddenly. No damage to the wood cover resulted.

Precast Concrete Covers and Fittings

Concrete manhole fittings have been manufactured by a number of companies. The particular design and model developed by the Cast Stone Institute is diagrammed in Figs. 3 and 4 and pictured in Fig. 5. In form, this manhole cover is essentially a king post truss, giving maximum load carrying capacity for the amount of steel and concrete which it contains. Attachment of the radial reinforcing rods to the inclosing channel rim is an important detail which contributes much to the strength of the cover by bringing the high compressive strength of the concrete into play under load. It also makes possible the relative thinness of the edge and the relative lightness of the cover. The rim serves the additional purpose of preventing chipping of the corners either from traffic wear or rough handling when manholes are opened.

The cover and frame are designed to carry the heaviest wheel loading permitted on highways (16,000 pounds plus 25 per cent for impact). Tests have shown carrying capacities even greater than the requirements. Part of the unusual strength depends on the excellence of the welding of the reinforcement web involved (see Fig. 5) and part on the concrete, which must be of considerably more than average quality. Such quality is necessary not only for structural adequacy but also for resistance to weathering and for protection of the reinforcing.

Suggested specifications for the manufacture of these manhole fittings require that the concrete in the frames and covers shall be dense and water tight, with a compressive strength at 28 days of age of not less than 7,500 pounds per square inch when tested in the form of 2-inch cubes, oven dried. Top surface of covers should have a smooth, hard-troweled finish, and the bottom surface should be coated with a hard drying asphaltum or similar material. The cover should lie flat in its frame, with the edges protected from chipping and ravelling. Suitable lifting hooks are needed.

The weight of these covers is considerably less than the standard iron cover which it replaces, being approximately 90 pounds as compared to 150 pounds for iron. The frame weighs approximately 200 pounds for a 24-inch cover as compared to 225 to 390 pounds for the iron frames. The total weight of steel used in the concrete frame and cover is 32 to 35 pounds, a saving of 300 pounds or more for each installation.

In cases where ventilation of manholes is necessary, holes can be readily provided by coring out between the ribs of the concrete cover to secure a total opening area of 49 square inches without affecting the load carrying capacity of the cover. (See Fig. 4.) Certain changes will allow a maximum of 100 square inches of opening.

In order to provide for larger sizes of openings there is a design for fittings up to 42 inches in diameter. Four sizes of frame (24, 30, 36 and

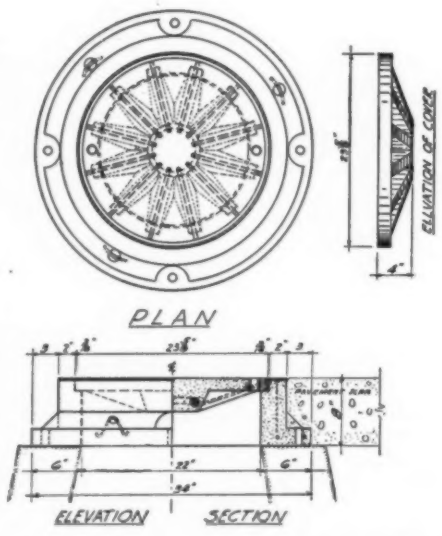


Fig. 3. Construction Details of Solid Reinforced Concrete Manhole Frame and Cover.

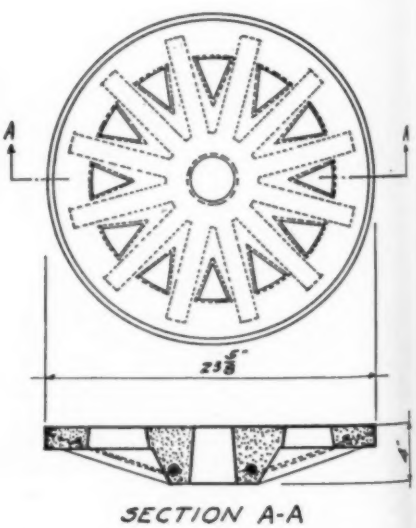


Fig. 4. Concrete Cover Cast With Triangular Vent Holes Between Ribs.

Fig. 5. Concrete Manhole Frame and Cover and Reinforcing Assembly for Cover.
(Exposed metal is coated with asphaltum.)

42 inches) with two sizes of reducer rings for use with two covers (24 and 30 inches), will provide the combinations necessary to accommodate the four sizes desired.

Terra Cotta Covers, Fittings

Precast reinforced terra cotta manhole covers and frames have been designed and developed by the Federal Seaboard Terra Cotta Corp. of New York. One unit with a solid cover except for lifting hole has a cover weight of 125 pounds and a frame weight of 245 pounds. Iron rods 0.263 inch in diameter spaced 4x4 inches form the reinforcing mesh. These rods are electrically welded at all intersections and to the ½-inch continuous rod at the periphery, lapped and welded 4 inches at the joint. The reinforcing assembly is located ¾ inch from the under side of the cover. In the frame eight ¼-inch rods are equally spaced on 12-inch centers, and four ⅜-inch rods, forming continuous rings lapped 4 inches at the joints. are welded to the vertical rods at all intersections. This particular design has shown an ultimate bearing load on a 12x12-inch area of 88,000 pounds and on an 8x8-inch area a load of 30,000 pounds. The cover is 3 inches thick.

Another design of a solid cover weighs 90 pounds and the frame weighs 114 pounds. This unit is intended for a different type of installation than the former. A third unit has a number of holes in the cover for ventilation. This cover and frame have the same weight as the first one described. The ventilated type of cover design is shown in Fig. 6. These terra cotta manhole fittings have found use in several army bases and camps.

While these are but three of the substitutes for metal manhole fittings, it is not unlikely that the ingenuity of engineers, faced with the urgent necessity of building many additional miles of sewers, will produce additional substitutes.

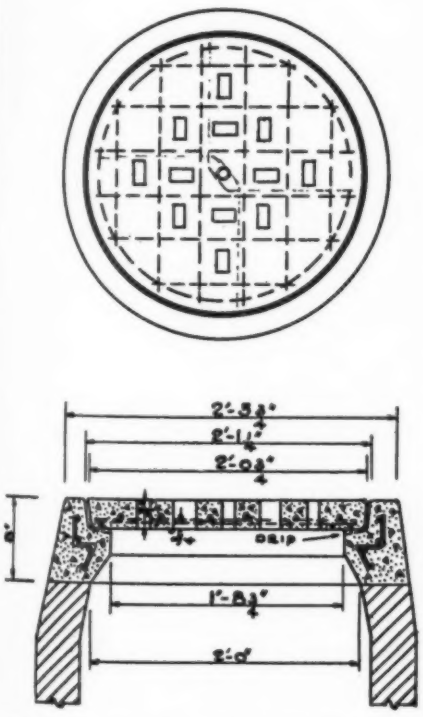


Fig. 6. Design of Terra Cotta Manhole Frame and Cover of Vented Type.

Dr. Willard Dow—Chandler Medalist 1943

Selection by Columbia University of Dr. Willard Henry Dow, president of the Dow Chemical Co., as the Chandler lecturer and medalist for 1943 throws the spotlight of the chemical world on this 46-year-old native of Midland, Mich. The citation accompanying the award named Dr. Dow as "one of the outstanding industrialists of the present generation," and noted as particularly spectacular the achievements of the company in producing bromine and magnesium from sea water. Since the announcement of the award another Dow magnesium plant has opened "somewhere in Michigan."

The Chandler Lecture Foundation was established in 1910 in honor of Prof. Charles Frederick Chandler, a pioneer in industrial chemistry and one of the founders of the American Chemical Society. Its purpose is to secure lecturers from time to time eminent in the field of chemistry and reward their achievements with a medal. This recognition of Dr. Dow highlights a career distinguished by business administration, scientific research, and pioneering in the fields where brine and its basic components play an important part.

After attending Midland High School, the 1943 recipient of the Chandler Medal was graduated from the University of Michigan in 1919 with a B.S. in Chemical Engineering. After graduation he went to work in the plant of his father, Dr. Herbert Henry Dow, who proved that the extraction of bromine from brine by electrolysis was commercially feasible. Dr. Willard Dow has held positions in the company of chemical engineer, director, assistant general manager, president and general manager, chairman of the board, as well as holding offices in several subsidiary companies. Dr. Dow is a member of several scientific societies. Other distinguished recipients of the Chandler Medal have been such men as L. H. Bakeland, Irving Langmuir, James B. Conant and S. W. Parr.

SAMPLING ERRORS

In Water and Sewage Plant Data

By DR. HAROLD A. THOMAS, JR.*
Graduate School of Engineering, Harvard University,
Cambridge, Mass.

AUTHORITIES have stressed the fact that nearly all the determinations in sanitary chemistry and biology are impaired to a marked degree by careless or insufficient sampling. And, every experienced operator of a water or sewage treatment plant realizes that the value of analytical determinations made in the laboratory depends upon the precautions taken to minimize the so-called sampling error. However, the conscientious operator eventually learns that sampling is inevitable accompanied by some sampling error, for notwithstanding all the care taken and effort put forth, this error can only be minimized, not eliminated. Moreover the process of minimizing the sampling error consists chiefly of sampling more frequently and carefully. Since there is a limit to the time he can allot for laboratory work, the average operator very often is obliged to record analytical results containing a considerable margin of sampling error.

The Modern Concept of the Small Sample

Recognizing then that most operational data in water and sewage treatment plants are not completely representative of actual conditions, the next logical step is to consider what interpretation may be made from the test results. It is the purpose herein to describe briefly and simply the modern concept of the small sample and to point out its application to sanitary chemistry.

Attempts have been made in the past to apply the classical theory of statistics in the analyses of water and sewage plant data. Such attempts have been generally unsuccessful and give formulas of exceedingly limited application. The explanation is that the number of samples examined in sanitary analysis is usually small, whereas the classical theory is strictly valid only for a large number of samples. However, recent years have seen the development of an adequate new theory of small samples. This development is associated with the name of R. A. Fisher.

*Instructor in Sanitary Engineering.

If, as is usually the case, the number of samples is limited, it is no longer permissible to assume that the results closely approximate actual conditions in the body sampled. The invalidity of assuming that the mean of a given set of experimental results represents the mean of the body sampled constitutes the main difference between theory of small samples and the classical theory. This limitation narrows considerably the latitude of interpretation that may be accorded test results. All that we can say is that the average is the best estimate available. How good the estimate may be we can never know for certain; but we may draw certain inferences of practical value. These will be described by means of examples in which the three following equations are used.

If there are n test results, namely, x_1, x_2, ... x_n, the arithmetic mean, M, is,

$$M = \frac{x_1 + x_2 + \ldots . x_n}{n} \qquad (1)$$

The dispersion of the data is given by the "standard deviation," D, as follows:

$$D = \sqrt{\frac{(x_1 - M)^2 + (x_2 - M)^2 + \ldots . + (x_n - M)^2}{n - 1}} \qquad (2)$$

Finally let the quantity "t" be defined by the following equation:

$$t = \frac{(M - M_s)}{D} \sqrt{n} \qquad (3)$$

Where M_s = any assumed value of the mean supposed to be a true value representing the body sampled.

Now for any series of determinations and any assumed value of the mean, we may obtain the two numbers t_0 and n_0. It may be shown (see "Statistical Methods for Research Workers" by R. A. Fisher) that for every set t_0 and n_0 there exists a certain chance, P, (expressed as a percentage given in Figure 1) that upon additional random sampling with a similar series of tests, the value "t_0" will be exceeded. This is logical, for we would naturally expect a second series to give a somewhat different average value from that of the original series. Furthermore, if the assumed mean (M_s) really were the true mean, then the laws of chance would determine the likelihood of the deviation of the second series exceeding that of the first. Now, without going to the trouble of testing a second series, from the value of P, we can form conclusions as to the likelihood of M_s really representing the body sampled.

Examples of Application of the Equations

A few examples will illustrate the significance of the foregoing.

The iron content in effluent samples from a water treatment plant is found sometimes to exceed and sometimes to be less than the value of 0.30 ppm. which is considered to be the highest permissible value of iron in the effluent. Given the following results for seven iron determinations, what is the possibility that the effluent exceeded the maximum permissible value of 0.30 ppm.?

Test	Total Fe ppm. = x	x—M	$(x-M)^2$
1	0.31	+0.03	0.0009
2	0.26	—0.02	0.0004
3	0.21	—0.07	0.0049
4	0.35	+0.07	0.0049
5	0.25	—0.03	0.0009
6	0.24	—0.04	0.0016
7	0.34	+0.06	0.0036
Sum	1.96		0.0172

From equation (1)

$$M = \frac{1.96}{7} = 0.28 \text{ ppm.}$$

Although the mean (0.28 ppm.) is less than the required limit (0.30 ppm) we cannot be sure that this slight difference is not merely the effect of sampling variations and that the actual value exceeded the permissible value. In order to obtain some insight in this matter we proceed as follows:

From equation (2)

$$D = \sqrt{\frac{0.0172}{7-1}} = 0.0535 \text{ ppm.}$$

From equation (3), taking $M_s =$ 0.30 ppm.

$$t = \frac{0.28—0.30}{0.0535}\sqrt{7} = —0.99$$

Then from Figure (1), with $n =$ 7, we obtain a value of P of approximately 80 per cent. The interpretation then would be that if the true average in the effluent *really were 0.30 ppm.*, only 20 times out of a hundred would such a series of seven random samples deviate downward so far, that is, down to an average of only 0.28 ppm. On the other hand 4 times out of 5 (80 per cent chance) the average would exceed 0.28 ppm. Consequently it is quite likely that the true average in the effluent was within the required limit of 0.30 ppm. despite the fact that some samples exceeded this limit.

As a second example, consider what interpretation a health department should make in the following case regarding the performance of an activated-sludge sewage treatment plant under its jurisdiction. In accordance with established procedure, the health department collects simultaneously two grab samples from the effluent of the plant each month in order to ascertain whether or not the plant is meeting the requirement that the B.O.D. should be less than 30 ppm. The samples when tested show respectively 18 ppm. and 62 ppm., with an average value, M, of 40 ppm. and a dispersion, D, (equation 2) of 31 ppm. Assuming M_s as 30 ppm., the permissible maximum, we obtain from equation (3)

$$t = \frac{40—30}{31}\sqrt{2} = 0.46$$

Entering Figure 1 with $t = 0.46$ and $n = 2$ we find P to be approximately 35 per cent. This means that if the plant effluent had indeed met the requirement of 30 ppm., the testing method used by the health department would show about once in every three times a deviation upward of at least 10 ppm. beyond the permissible limit, as it did in this example. Consequently it would be unfair to condemn the operation of the plant on the basis of this test, even though one of the samples showed twice the permissible amount of B.O.D.

Other Applications of the Method

With the foregoing method of analysis it is possible to compare the test result with any assumed value of the mean and, by means of the associated probability, to assign relative degrees of credence to each of the values assumed. Various other similar interpretations and manipulations are of practical importance. An especially interesting and useful application of the method appears in the analysis of two series of parallel tests, one series being conducted as a control, the other to test the effect of some innovation in water or sewage treatment. An example will

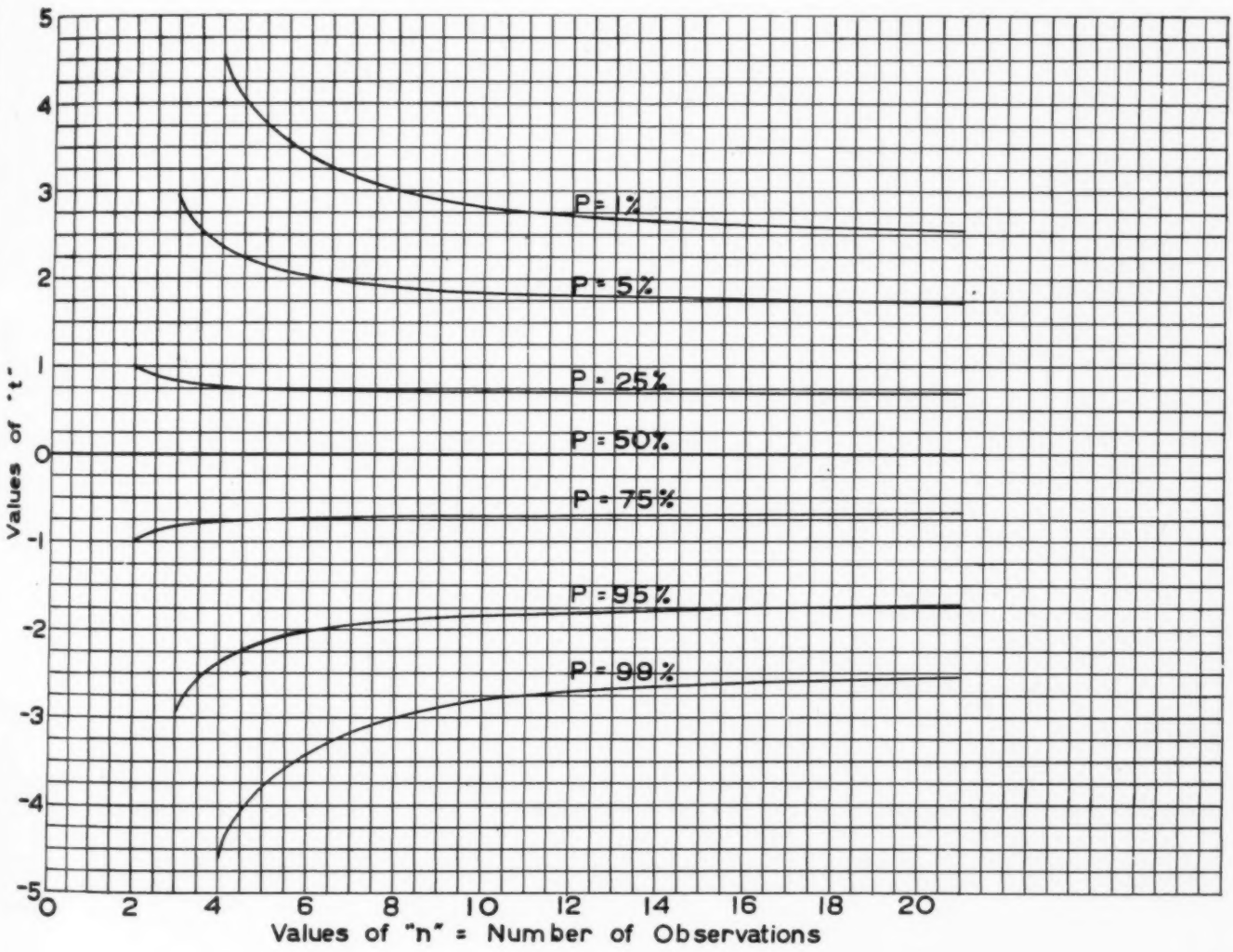


Figure 1

Relationship between number of samples tested and the deviation from the assumed mean in terms of the probability that the deviation will be exceeded in additional random sampling. (See equations 1, 2 and 3.)

be taken from plant-scale tests made by the author in studying the effect of the flocculation of sewage without chemicals prior to sedimentation. Here two series of suspended solids determinations were made upon the effluents of two similar sedimentation basins. The first series (a) showed the effect of preflocculation (compressed air 10 minutes, gentle mechanical stirring 20 minutes), followed by sedimentation (1.5 hours); the second (b) series showed the effect of sedimentation alone (1.5 hours). The differences in the suspended solids (ppm.) in the effluent ((b) minus (a)) for each pair of determinations in the two series were as follows: 34, 9, —11, 39, 26, 0, —6, 29. The average difference, M, is 15 ppm. This difference indicates that a smaller amount of suspended solids appeared in the effluent which was pre-flocculated, hence that the flocculation was apparently effective. But before we can reach this conclusion definitely, we must consider first that had there been no flocculation at all, we should still expect some difference in the two series due to random sampling variations. Is it likely that an average difference of 15 ppm. could have occurred if the flocculation had no effect whatsoever? This question can be answered if we form as a working hypothesis (whether we believe it or not) that preflocculation had no effect on the effluent. If this were the case, then for a large number of tests we should expect the average difference to be zero. Hence $M_n = 0$, and given the mean (M) of the foregoing eight tests as 15 ppm., the value of the dispersion (D, from equation 2) as 19.4 ppm., then the value of t from equation (3), is,

$$t = \frac{15-0}{19.4} \sqrt{8} = 2.2$$

Referring to Figure 1 with $n = 8$, and $t = 2.2$, we obtain an approximate value of $P = 3$ per cent. That is, on the basis of the assumption that the mean difference is zero (preflocculation has no effect), we learn that only three times out of a hundred similar tests of eight would chance permit a deviation as great as 15 ppm. Since such a deviation as this is unlikely, we should conclude that there is something wrong with our initial hypothesis, and consequently that there is indeed a significant improvement resulting from preflocculation.

In conclusion it has been shown that, although it cannot be eliminated, the sampling error can always be analyzed in such a manner as to throw a clear quantitative light upon the significance of the test results. With the elimination of uncertainties as to interpretation, the analyst is able to make a more intelligent use of operational data.

Uel Stephens, New Sup't. of Water and Sewerage at Fort Worth

Uel Stephens has been chosen to succeed the late Lewis A. Quigley

Uel Stephens

as Supt. of the Ft. Worth Dept. of Water and Sewerage.

In 1919 Mr. Stephens became assistant city engineer at Waco, Tex., and during the next ten years held various engineering posts with the Texas State Highway Dept., Runnels County, and the Clay Products Association. He was also a member of the firm of Terrell Bartlett Engineers, Inc., from which he entered private practice in 1930.

A graduate of Texas A. and M., Mr. Stephens served as a Captain of Infantry in World War I, and now holds the rank of Lt. Col. in the U. S. Army Reserve, in which he has been quite active.

Well known both as an engineer and as a member of various organizations, Mr. Stephens is expected to bring to his position an experience that will serve him well in his new duties.

From 1933 to 1940 Mr. Stephens held various posts with the Public Works Administration.

New Handbook on Plumbing Practices

"PLUMBING PRACTICE AND DESIGN," Volume I, of a two volume work, by Svend Plum, is a book written to consolidate scattered data on the subject of plumbing, "an ancient and useful craft," and to present them in a uniform terminology. In the author's words, he has "tried to make this book insofar as it is a handbook, usable for solving the many problems in design of plumbing systems." Written primarily for designing architects and engineers, and plumbing contractors, rather than for journeymen plumbers, the book is indeed a handbook. With the exception of Chapter 1, which presents a general discussion of corrosion and the resistance of metals to corrosion, the entire book is replete with standards for various materials, specifications, designs, and dimensions of various pipes and fittings, valves and controls, fixtures and accessories, as well as pumps, air piping and equipment. In the preface the author explains — "because the specifications are not extensive, and also to overcome the difficulty in discussing work which is filled with an excess of terms overlapping each other or duplicating themselves, I have given a great number of definitions. These definitions also take the place of more extensive text of borderline subjects." In addition to the above subjects presented, one chapter is devoted to fire protection equipment.

The completeness with which the author has proceeded in the preparation of the book is indicated by the number of topics or phases of the subject matter discussed under each chapter. For example, under *"Materials"* there are 11 topics; under *"Pipes and Fittings,"* 17 topics; under *"Fixtures,"* 15 topics. Each topic is broken down into several sub-topics. The book should make a useful addition to the library of any designing engineer or contractor concerned with the preparation of plans for, or construction of, plumbing equipment. It brings together, into one place, technical data, concerning plumbing, now scattered among various handbooks, text books, reports and pamphlets of different manufacturers. The book [5⅞"x9"] cloth bound, contains 308 pages and is published by John Wiley & Sons, Inc., of New York. It retails at $4.50. Volume II of Mr. Plum's "Plumbing Practice and Design" is now in preparation.—G.E.S.

"Wally" Miller Now Navy Lieutenant

Wallace T. Miller, Jr., Sup't of Water at Ossining, N. Y., and recently elected chairman of the N. Y. Section of A.W.W.A., has left his position for the duration to accept a commission as Lieutenant - Senior Grade in the U. S. Navy, which he will serve as Assistant Civil Engineer.

For the present, at least, Mr. Miller will be stationed at Camp Peary and will continue to serve the New York Section as chairman, inasmuch as his resignation was considered and returned to him by the Trustees.

BIOLOGICAL WATER CONDITIONING

Some Observations in Judson Reservoir, Southern California

By HENRY C. MYERS
Chemist and Chief Operator
CALIFORNIA WATER AND TELEPHONE CO.
PALM CITY, CALIFORNIA

THIS short paper has a two-fold purpose: to point out a remarkable reduction in hardness of a water due to a growth of Chara (sp.) and to show that this aquatic plant has an inhibiting effect upon algae, due to its ability to utilize the bicarbonates of calcium and magnesium as a source of carbon in the process of photosynthesis.

Although it is well known that species of Chara precipitate calcium carbonate, it is believed that the *degree* to which this may affect the conditioning of a stored water is not so well known. It is also quite well known that many forms of algae precipitate calcium carbonate due to the exhaustion of free carbon dioxide with subsequent decomposition of bicarbonates during photosynthesis. The results recorded in this paper are believed to be due entirely to a growth of Chara.

Limnological observations have been made upon Judson Reservoir, in Southern California, since 1937, and the results of some of these observations have been compared with observations made upon nearby Sweetwater Lake.

Judson Reservoir has a storage capacity of 212,456,000 gallons, an area of 35.52 acres and a maximum depth of 45 feet when full. However, only a very small percentage of this area has a depth greater than 25 feet. During the year 1940, when the observations tabulated in this paper were made, the maximum depth was less than 30 feet. There is an interception ditch around the entire reservoir which carries away any runoff due to rains. Judson Reservoir is filled during the winter months by a pipe line from Sweetwater Lake while, throughout the summer months, the water level is gradually lowered because of increased water demand.

For purposes of comparison it may be stated that Sweetwater Lake has an area of 1,030 acres, a maximum depth of about 90 feet and a storage capacity of 29,065 acre feet.

TABLE 1
Comparison of Analyses of Waters from Sweetwater Lake and Judson Reservoir
Samples taken July 22, 1940

Constituent	Sweetwater Lake	Judson Reservoir
Ca	46 p.p.m.	22 p.p.m.
Mg	22 p.p.m.	22 p.p.m.
Na	59 p.p.m.	59 p.p.m.
CO_3	0 p.p.m.	22 p.p.m.
HCO_3	212 p.p.m.	93 p.p.m.
Cl	85 p.p.m.	88 p.p.m.
SO_4	38 p.p.m.	35 p.p.m.
Total hardness	206 p.p.m.	146 p.p.m.
Non-carbonate hardness	32 p.p.m.	34 p.p.m.
Carbonate hardness	174 p.p.m.	112 p.p.m.

Observations

In the spring of 1940 the chemical quality of the waters from Sweetwater and Judson were nearly identical. By the middle of April changes in chemical characteristics of the water at Judson Reservoir began to be quite noticeable. These changes steadily increased until in August the differences in water quality were the greatest. At this time the older stalks of Chara were heavily incrusted with calcium carbonate which had been precipitated from the water.

Chara starts growing in early spring and eventually covers the entire bottom of Judson Reservoir. As it becomes more abundant the pH of the water rises, the methyl orange (total) alkalinity decreases, and the algae die off. Simultaneously, water transparency increases. Wild ducks make their first seasonal appearance in August. They feed on the Chara until by December the beds have totally disappeared. Closely following the reduction of Chara, there is a gradual decrease in pH and an increase in methyl orange alkalinity. Algae become more plentiful and transparency decreases. The cycle as outlined above occurs each year. The reduction of Chara due to the activity of ducks has prevented the occurrence of unpleasant tastes and odors, which would occur if large masses of the plant were allowed to decompose. Although Chara grows about the margins of Sweetwater Lake, its effect upon water quality is negligible as compared with the effects at Judson. This is because the ratio of the volume of Chara to the volume of water in Sweetwater is extremely low, while in Judson it is comparatively high.

From Table 1 it will be observed that, at Judson Reservoir, calcium is precipitated but not magnesium. There is also a considerable reduction in bircarbonates. This reduction in bicarbonates is due to the utilization of the half bound carbon dioxide by Chara. Non-carbonate hardness is not changed, but the maximum observed reduction in total hardness was 60 parts per million.

Chara Holds Down Algae Growth

Chlorides in both Sweetwater and Judson increase in the summer due to evaporation, and probably to cyclic salt from the nearby ocean. Since measurements show that chlorides run parallel in the two reservoirs, it may be assumed that evaporation effects are the same on both bodies of water. Although the hardness of water at Judson decreases during the summer, the hardness at Sweetwater increases, because of evaporation. This is further evidence that the softening at Judson is due to Chara more than to plankton forms, since the latter are never abundant in Judson. In fact, algae here are restrained because of the removal by Chara of the available carbon.

Observations in Table 2 are recorded only to September 30, because from this time on water flowed into Judson Reservoir and thus altered the quality of the stored water.

TABLE 2
Comparison of Some Observations Made on Sweetwater Lake and Judson Reservoir During the Year of 1940

Date	Sweetwater Lake pH	Sweetwater Lake M.O. Alk.*	Sweetwater Lake Visibility ft. in.	Judson Reservoir pH	Judson Reservoir M.O. Alk.*	Judson Reservoir Visibility ft. in.
April 8	8.4	162	7 0	8.5	162	10 6
15	8.0	171	10 0	8.4	162	16 6
22	8.2	171	14 3	8.4	157	16 0
29	8.2	173	....	8.4	160	16 6
May 6	8.2	174	23 0	8.4	154	14 6
13	8.3	172	27 6	8.5	146	9 2
20	8.1	176	25 0	8.4	138	14 6
27	8.0	177	12 0	8.4	131	15 6
June 3	8.1	173	16 6	8.4	126	22 2
10	8.2	177	9 6	8.6	125	24 0
17	8.3	175	9 0	8.7	120	16 8
24	8.4	178	10 0	8.8	120	19 0
July 1	8.2	172	12 6	8.9	110	16 6
8	8.3	173	12 6	8.9	109	20 6
15	8.3	178	13 6	8.9	117	17 0
22	8.0	174	11 6	8.9	112	19 0
29	8.3	177	9 7	8.9	115	12 2
Aug. 5	8.3	180	7 3	8.9	112	12 0
12	8.3	180	6 3	8.9	115	11 8
19	8.3	180	4 8	8.9	120	12 0
26	8.2	176	7 3	8.8	113	13 6
Sept. 3	8.1	178	7 8	8.6	119	20 0
9	8.1	173	6 0	8.5	124	19 6
16	8.3	186	5 8	8.6	124	16 8
23	8.3	181	3 0	8.5	126	20 0
30	8.4	180	6 0	8.4	129	18 0

*P.P.M.

Clarification Improves as Result

Transparencies were measured by means of a 7-inch Secchi disk. The wide variations in visibilities at Sweetwater Lake were due to various stages of plankton growth and decomposition. The decrease at Judson during August was due to a growth of the diatom Fragilaria, which disappeared without requiring treatment. There was but an occasional slight growth of various diatoms in Judson Reservoir throughout the summer. The blue-green algae or Cyanophyceae do not grow there at this time. They make their first appearance in late fall, some little time after Chara has been depleted.

During the year of 1940 Judson Reservoir was not treated with copper sulfate until November 26, it being treated but once during the whole year. Members of the Cyanophyceae may appear in Sweetwater Lake at any time and in sufficient quantities to be troublesome. Sweetwater Lake was bluestoned seven times in 1940, four of the treatments having been made during the summer months.

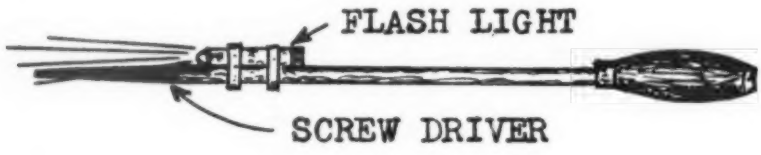
Conclusions

The growth of Chara in a shallow body of water, such as Judson Reservoir, inhibits algal growth. Bicarbonates are broken down in order to supply Chara with the carbon dioxide which is required in photosynthesis. Calcium carbonate is precipitated, largely upon the growing Chara, a process which results in material softening of the surrounding water. The competition for carbon dioxide between Chara and the plankton algae is an unequal one, in which Chara is the more efficient contestant, and as a result most of the smaller organisms fail to survive.

Screwdriver With a Headlight

Here is a handy kink for use in the daytime as well as at night. Many a time I have had difficulty in "seeing the slot" in the head of a screw and have been obliged to grope and feel around for it.

Flash lamps are now made in such extremely small sizes that I hit upon the idea of fastening a flash lamp to the shank of a screw-driver, as indicated in the sketch. The light accomplishes its purpose very well. With this arrangement I can now plainly see the screw slot at any time—night or day.



Some time ago I did the same thing with an oil can, fastening the flash lamp in such a position that it lighted the end of the spout. I found it to be a great time and oil saver, but it did not occur to me at the time that the same idea could be applied so admirably to a screw-driver.

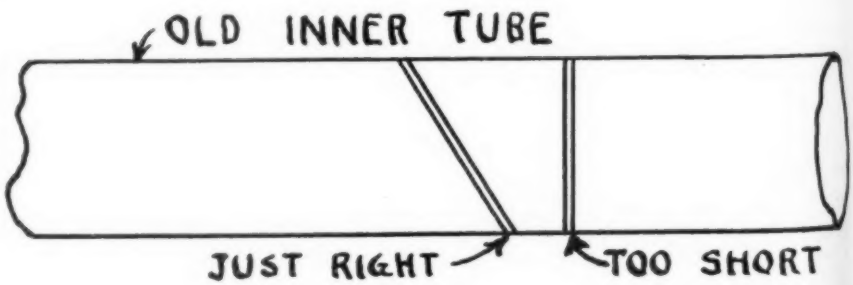
(Contributed by W. F. Schaphorst, M.E., Newark, N. J.)

Making Endless Belts and Rubber Bands Out of Old Inner Tube

Small belts are widely used today, some of them being made of round leather and some of rubber. Not long ago this writer was up against the problem of providing such a belt, and since he did not have any leather he attacked the problem by making use of an old automobile inner tube as indicated in the sketch.

The first belt, cut straight across, was a bit "Too Short" as shown. It "worked," yes, but it was unnecessarily tight. A tight belt is hard on the bearings, causing them to wear and consume more power than they should. So the next one was cut at an angle as indicated by the words "Just Right." This produced a belt of correct length. Obviously, by following this method it is possible to make excellent emergency rubber belts, of many lengths, out of a single old inner tube.

(Contributed by W. F. Schaphorst, M.E. Newark, N. J.)



WATER AND SEWAGE PATENTS

A Digest
By JULIAN F. SMITH
Associate Editor
HOOKER SCIENTIFIC LIBRARY
CENTRAL COLLEGE
MISSOURI

Water Patents

WATER RECLAIMER. E. S. Clemens (to Water Reclaimer Corp.). U. S. 2,305,408, Dec. 15. Apparatus comprising a condenser, an evaporator tank and means for blowing air from the condenser through the evaporator.

TREATING WATER. E. R. Williams (one-half to Ella E. Williams). U. S. 2,306,147, Dec. 22. Adding sodium silicate and a petroleum sulphonate to water.

DETERMINING SALINITY. G. B. Ellis (to Control Instrument Co.). U. S. 2,306,691, Dec. 29. Electrical apparatus for measuring the salinity of water utilizes a cell in which the current varies with salt content.

WATER FILTRATION. John B. Fender. U. S. 2,306,720, Dec. 29. A filtering plant has a settling basin to which a chemical treating agent is fed from a special container.

SILICA REMOVAL. C. A. Noll and J. J. Maguire (to W. H. and L. D. Betz). U. S. 2,307,466, Jan. 5. Removing dissolved silica from natural water by heating with magnesia and sufficient caustic soda to impart the requisite alkalinity.

ION EXCHANGE. O. M. Urbain and W. R. Stemen (to Chas. H. Lewis). U. S. 2,309,363-4, Jan. 26. Reacting powdered coal with molten ferric chloride to form a base exchange reagent by alkali treatment; and forming a hydrogen exchange reagent by the same method excepting that the final treatment is with acid instead of alkali.

WATER PURIFIERS. O. M. Urbain (to Chas. H. Lewis). U. S. 2,309,365-6, Jan. 26. In preparing a reagent for freeing potable waters from tastes, odors and color granulated asphalt is treated with concentrated sulphuric acid; and in making a reagent for removing sulphate, phosphate, fluoride or other contaminating ions asphalt is treated with hot concentrated aqueous alkali.

COLLECTING SEDIMENT. J. D. Walker (to American Well Works). U. S. 2,309,556, Jan. 26. Collecting apparatus for a settling tank has collecting blades carried by a chain and sprocket device.

SEAL. T. S. Miller (to Water and Sewer Equipment Corp.) U. S. 2,309,658, Feb. 2. Sealing water mains at joints with an inflatable ring backed by a sealing composition applied as a melt.

WATER PURIFICATION. C. L. Baker and C. H. Dedrick (to Philadelphia Quartz Co.), U. S. 2,310,009, Feb. 2. As a coagulation aid for use in raw waters, an incipient silicate precipitate prepared from sodium silicate and a metal salt.

REAGENT FEED. Harry L. Baer. U. S. 2,310,051, Feb. 2. Apparatus for feeding an undiluted reagent to a water pressure pipe line from a collapsible bag contained in a tank.

WATER FILTRATION. Chas. E. Palmer, U. S. 2,309,916-7, Feb. 2. A method and apparatus for agitating filter beds by the motion of backwash water; and a rotary agitator having a rotary conduit arm fed from the water supply conduit.

REAGENT FEED. R. M. Potter (to Western Filter Co.). U. S. 2,310,459, Feb. 9. An electrically controlled device for feeding a liquid reagent to flowng water in specified proportions.

WATER SOFTENER VALVE. C. T. McGill and O. F. Dubruiel (to Elgin Softener Co.). U. S. 2,310,978, Feb. 16. An automatic device for operating the control valve of a water softener is shiftable from a service position through successive regeneration positions back to the service position.

SOFTENING WATER. N. B. Tucker (to Procter and Gamble Co.). U. S. 2,311,008, Feb. 16. Water softening reagents which do not form a precipitate include ethers derived from a polyglycolic acid and a carbohydrate, a polyhydric alcohol or a polyhydrovy acid.

PRECIPITATING METALS. J. S. Reichert and A. A. Elston (to E. I. du Pont de Nemours and Co.). U. S. 2,311,316, Feb. 16. Use of persulphuric acid as a reagent for softening hard water without precipitation, and for use as a detergent.

STERILIZER. Carl A. Carring. U. S. 2,311,519, Feb. 16. A combined filter and sterilizer has a filter basket with a sterilizing compartment and a pure water compartment.

FILTER CLEANER. Chas. Lose, Jr., U. S. 2,311,594, Feb. 16. A cleaner for filter beds has a hollow tooth into which sand from a filter bed is drawn, and a deflector at the top thereof.

TREATING COOLING WATER. C. J. Sprigman and S. T. Powell (to Socony-Vacuum Oil Co.). U. S. 2,312,221, Feb. 23. The discharge from a cooling system is passed through an oil separator in which oil recovery is improved by chemical destruction of algae in the water.

Sewage Patents

GREASE RECOVERY. Wells S. Fleming (to Ruth Newman and Mildred Hirshstein). U. S. 2,307,498, Jan. 5. Apparatus for reclaiming oil or grease from waste water by controlling the water and fat levels and drawing the fat off through an outlet port.

SEWAGE SCREENINGS. Jas. F. Bolton, U. S. 2,308,264, Jan. 12. Apparatus for dewatering and treating sewage screenings on a perforated table which drains off the excess water.

CLARIFYING SEWAGE. Jas. F. Bolton. U. S. 2,308,670, Jan. 19. A settling tank having a separating chamber with a conical bottom from which accumulated solids are drawn off.

CLARIFYING SEWAGE. R. D. Nichols (to Jeffrey Mfg. Co.). U. S. 2,309,002, Jan. 19. A grit settling tank for sewage has a classifier for separating organic solids from the grit.

PETROLEUM WASTES. Wm. Graham (to Richfield Oil Corp.). U. S. 2,309,062, Jan. 19. A chlorination method for removing organic impurities from oil well or oil refinery waste waters.

SEWER PIPES. Paul E. Scott. U. S. 2,310,122, Feb. 2. A self-centering wire support for use in sewer pipe joints.

PURIFYING SEWAGE. Phillip C. Schneider (one-half to Paul B. Joyce). U. S. 2,310,655, Feb. 9. Destroying bacteria in natural waters or sewage by adding ferrous ammonia sulphate and a marl containing at least 25% calcium carbonate.

TREATING SEWAGE. C. G. Hawley (to Hawley Engineering Corp.). U. S. 2,311,830, Feb. 23. Apparatus for screening organic waste from polluted water has a screen-controlled pocket leading to a treating chamber, and a feed control arrangement including a suction box and a centrifugal tuyere.

SEWER TRAP. Stuart Nyboer. U. S. 2,311,858, Feb. 23. A gas-discharging sewer trap, especially designed for removing toxic gases from garages, has a standpipe to provide a draft for carrying off carbon monoxide and other gases.

Sewage Plant Operators Strike at Buffalo, N. Y.

Climaxing a long period of disagreement with the Board of the Sewer Authority of Buffalo, N. Y., sewage works operators of that city early this week went on strike in protest against a wage scale adopted by the Board. The men walked out between 11 and 11:30 a. m. on Friday, May 7, and plant operations came to a standstill at that time. However, automatic operation of certain outlying pumping stations, where shutdown would have caused flooding of basements, was not interfered with.

Because of the fact that Buffalo sewage is discharged into the Niagara River from which four communities take water, attempts were made to give temporary emergency chlorination to the raw sewage. With the aid of chemists from the Mathieson Alkali Works in Niagara Falls, which supplies the plant with chlorine, a system was rigged up whereby liquid chlorine was added from a Sparger tube to the raw sewage as it rises from the incoming conduits to the inlet well. By applying the chlorine at this point some fifty feet below the level of the emergency overflow and utilizing a part of the inlet well as a contact basin it was possible to obtain approximately ten minutes contact time before the raw sewage was discharged directly into the Niagara River. According to George Fynn, chief chemist at the Buffalo plant, this disinfection period would provide a kill of approximately 90 per cent of the coliform bacteria present.

Inasmuch as only the operators struck, the technical administrative and supervisory staffs were available to assist in rigging up this emergency disinfection treatment, which had first been outlined and planned last December, when a similar strike was threatened. The foresight of such planning made it possible to install the system with a minimum of delay.

Following the walkout, the Sewer Authority Board met immediately, as did the men who formed a union last fall. After deliberation the Board wired the union that unless the men were back at work by 8 o'clock that evening (May 7) their jobs would be considered forfeited. All jobs involved have civil service status and, as such, to leave the job is to forfeit civil service rights. By 6:30 p. m. on the same evening the men had returned and plant operations were resumed.

On the following day a meeting was held between the Board and the union representatives at which Frank Boland, formerly of the State Labor Board, was an unofficial observer at the request of the State Labor Board. No decision was reached and the meeting was continued until the following week. (As of this writing, the dispute has not been settled.)

Source of the discontent leading to the strike goes back to a request of last year for increases in pay which would be comparable to the rise in the cost of living in Buffalo. At that time the Board was waiting for the Civil Service Commission to complete a study of civil service ratings of the various operator and labor classifications. With no action forthcoming on the salary raise request the men formed a union and threatened a strike last December. The Board then acted to grant temporary raises, for the war duration only, amounting to 14 per cent in the rate brackets up to $1500 and from $100 to $200 for the bracket up to $2,000, with no raises above that level. It was also promised that when the civil service survey was completed adjustments would be made accordingly on a permanent basis with consideration also being given to a special wartime bonus.

When the Board reached a final decision setting up permanent salary classifications it apparently was not in accord with the men's idea of the value of the various job classifications. Maintenance men and Sludge Disposal Operators (Incinerator Operators) were placed in the same class as the Main Pump Operators with salaries ranging from $2100 to $2400 whereas formerly these classifications had rereceived a flat salary of $2200 yearly. Grit and sedimentation operators (including chlorine operators) are to receive $2100 top salary with a starting salary of $1800. Formerly this salary was $1800 the first year and $2000 thereafter. These salary ranges were in accordance with the findings and recommendations of the Civil Service Survey Salary and are to be permanent. No wartime bonus was to be granted. The union demands were generally for salary classifications of $300 more in the case of the operators and some other minor adjustments.

When the strike was called, there was considerable unfavorable publicity towards the cause of the employees, one newspaper calling it a crime against human decency. The City Commissioner of Health warned that the people should boil the water for drinking purposes. For Buffalo this was an unnecessary precaution as the water supply intake is nearly two miles above the sewage outlet, which discharges into the Niagara River at a point where the velocity is approximately 8 miles per hour. A warning to all water plants below Buffalo, by the District Health Engineer of the State Dept. of Health, coupled with the emergency chlorination at the plant, apparently forestalled any epidemic of intestinal disease in cities below Buffalo, according to Mr. John W. Johnson, Works Supt. of the Buffalo Sewage Treatment Plant.

[As far as we are aware this constitutes the first organized walk-out of operators of a sewage treatment works. Was also a test of the effect of civil service ratings on the behavior of unionized municipal employees who have pensions as well as jobs at stake.—Ed.]

Springfield, Ill., Has New Water Head

After sixteen years as commissioner of finance of Springfield, Ill., Mr. Harry B. Luers took over the responsibility of the city light, water and power department when he defeated Willis J. Spaulding at the primary in April. Mr. Spaulding had served as Commissioner of Property in charge of the water, light and power department for thirty-four years and had run again this year in hopes of establishing a nonpolitical board to preside over the municipally owned power plants.

Charles H. Spaulding, brother of Willis and longtime chemist and superintendent of Filtration at Springfield, and inventor of the Spaulding Precipitator, has resigned his position.

Cause of Water Noise Being Studied by Armour Research Foundation

The study of the causes and the methods of reducing the noise resulting from water flow through pipes and valves has continued for another year. Apparatus designed for this research problem has included a recording sound level meter and two large pressure (0 to 100 pounds per square inch) tanks supplying water to a specially equipped sound-insulated room. The work has included some studies of valves to be used on ocean-going vessels where the valves are subjected to the corrosive action of salt water.

MEETINGS SCHEDULED:

May 20—BOSTON, MASS. (Hotel Statler).
New England Water Works Association. (Monthly meeting.) Secretary, Frank J. Gifford, 613 Statler Building, Boston, Mass.

May 26—NEW HAVEN, CONN. (Hotel Garde).
New England Sewage Works Association. (Annual Spring Meeting.) Sec'y-Treas., LeRoy W. VanKleeck, State Dep't. of Health, State Office Bldg., Hartford, Conn.

June 4-5—ROCHESTER, N. Y. (Seneca Hotel).
New York State Sewage Works Association. Secretary, A. S. Bedell, State Dep't of Health, Albany, N. Y.

June 8—HARRISBURG, PA. (Hotel Penn-Harris).
Pennsylvania Water Works Operators' Association (Annual Meeting.) Sec'y-Treas., I. M. Glace, 22 S. 22nd St., Harrisburg, Pa.

June 9—HARRISBURG, PA. (Hotel Penn-Harris).
Pennsylvania Sewage Works Association (Annual Meeting.) Secretary, Bernard S. Bush, State Dept. Health, Harrisburg, Pa.

June 15-18—CLEVELAND, O. (Statler & Carter Hotels).
1943 A.W.W.A. (Wartime Water Works Conference). Executive Secretary, Harry E. Jordan, 500 Fifth Ave. New York, N. Y.

June 23—MANSFIELD, OHIO (Mansfield-Leland Hotel).
Ohio Conference on Sewage Treatment. Secretary, J. R. Turner, % Sewage Treatment Plant, Mansfield, O.

Sept. 16-17—DENVER, COLO. (Hotel to be selected).
Rocky Mountain Section, A.W.W.A. Secretary, O. J. Ripple, Supt. Filtration, Littleton, Colo.

Sept. 22-23—PITTSBURGH, PA. (Roosevelt Hotel).
Western Pennsylvania Section A.W.W.A. Secretary, Earle P. Johnson, Wallace & Tiernan Co., 418 Flannery Bldg., Pittsburgh, Pa.

Sept. 28-29—BOSTON, MASS. (Hotel Statler).
New England Water Works Association. (Annual Convention.) Secretary, Frank J. Gifford, 613 Statler Bldg., Boston, Mass.

Oct. 11-13—OKLAHOMA CITY, OKLA. (Hotel Biltmore).
Southwest Section, A.W.W.A. Secretary, Geo. J. Rohan, Supt., Water Works Municipal Bldg., Waco, Texas.

Oct. 21-23—CHICAGO, ILL. (Hotel Sherman).
Federation of Sewage Works Association. Annual Meeting, "War Time Conference." Secretary, H. W. Wisely, Urbana-Champaign Sanitary District, Urbana, Ill.

Oct. 27-29—LOS ANGELES, CALIF. (Biltmore Hotel).
California Section, A.W.W.A. Secretary, H. Arthur Price, Box 3669, Terminal Annex, Los Angeles, Calif.

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LITERATURE AND CATALOGS

Everson "Sterelators" are pictured and described in two recent bulletins of the Everson Manufacturing Co. of Chicago.

Bull. No. 1085 presents the "Hydromatic," an hydraulically operated Automatic Gas Sterelator. This is a chlorine gas solution feeder with an indicating meter, for automatic proportioning of gas feed to water flow with a simplified hydraulic pressure regulated gas flow control valve. It can be manually operated for breakpoint chlorination, or in cases of emergency. Automatic operation is for ratios of 5 to 1. Manual operation is for ratios of 10 to 1. The machine is obtainable either with a "Rotameter" or a Naperian meter. The bulletin contains a complete description of the machine and its operation.

Bull. No. 1087 presents the "Electrono-matic," an electrically Automatic Gas Sterelator which automatically proportions gas feed to water flow in ratios of 10 to 1. This automatic operation is through a pressure differential converter, and electric proportioning gas throttle valve. Three operations are possible: (1) automatic electric operation proportioning chlorine feed to water flow at any selected rate, (2) manual electric operation for temporary selection of any rate of gas flow within limits of meter regardless of water flow, and (3) manual emergency operation for complete hand operation, said to be very efficient for breakpoint chlorination. The Electric Robot which controls this machine is also shown and described in this bulletin. For bulletins Nos. 1085 and 1087, or additional information, write the Everson Manufacturing Co., 214-16 W. Huron St.. Chicago, Ill.

Ideal Rechargeable Storage Flashlight Batteries are advertised by the Ideal Commutator Dresser Co. in a recent pamphlet. The limitation of Flashlight Dry Cell production has focused attention on rechargeable storage batteries for flashlights. Small in size to fit all popular two cell 1¼ in. size D Flashlight cases, this rechargeable battery has proven to be dependable, long lived and economical. It is claimed that each battery can replace 400 ordinary flashlight dry cells, simply by recharging at convenient periods. Battery chargers are available for this purpose, both singles and gang types, for use on both alternating and direct current. The Ideal Battery is not distributed for casual use but under present conditions is directed to large manufacturing plants, utility plants and other sources where flashlights are regularly used. One discharge of the battery is approximately equivalent to two ordinary dry cells; the rechargeable feature makes it convenient to use only while light is bright and charge when light becomes dim. For further information address a card or letter to Ideal Commutator Dresser Co., Sycamore, Ill.

Priorities for the Maintenance of Chlorination Equipment is Wallace and Tiernan's Priorities letter W-7 which points out that "There's just one job today—To Win—and that neither will water *alone* nor *other* war materials *without* water do the job. Operation of water plants is important and it is important to know the most recent orders and rulings with regard to priorities and preference ratings. Utilities Order U-1 supersedes Preference

New Flow Rate Indicator
Responds INSTANTLY to Flow Changes

THE NEW Rota-Sight flow indicator tells the operator the instant that the flow changes — even with very low flows. • The indicating rotameter-type float gives a wide range over a short scale length. • The float is visible in opaque liquids. • Rota-Sight warns operator of too high or too low flows. • Easy to install — universal inlet and outlet connections. • Nothing to get out of order. • Rota-Sight is inexpensive. • Piping connections for ½" to 2½".

The Rota-Sight is the modern answer to the demand for a sensitive flow rate indicator, applicable wherever an approximation of flow rate is an operating aid or necessity.

For complete information on the Rota-Sight write for Bulletin 101.

FISCHER & PORTER COMPANY
545 COUNTY LINE ROAD, HATBORO, PA.

SPECIALIZED LINE of patented equipment of improved design for efficient operation of sewage and water treatment plants. A large Jeffrey-equipped plant is shown.

- Bar Screens (mechanically cleaned)
- Chemical Feeders (electric vibrating)
- Floctrols (controlled flocculation)
- Grit Collectors and Washers
- Primary and Secondary Sludge Collectors
- Sludge Elevators
- Screenings and Garbage Grinders

(All patented)

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(Established 1877)
996-99 North Fourth Street, Columbus, Ohio

Baltimore, Birmingham, Boston, Buffalo, Chicago, Cincinnati, Cleveland, Denver, Detroit, Harlan, Houston, Huntington, Milwaukee, New York, Philadelphia, Pittsburgh, St. Louis, Salt Lake City, Scranton

Rating Order P-46 and provides the water plant with the necessary priorities rating to obtain maintenance, repair and operating supplies. This order grants to all utilities a priority rating of AA-1 which may be applied to purchase orders for maintenance, repair, and operating supplies by endorsing a preference rating certification. Sewage treatment plants and systems are no longer included in the utility group and are not entitled to use Order U-1. They may, however, obtain maintenance, operating and repair supplies under the new order P-141 or the Controlled Materials Plan Regulation 5A, by placing a special certification on all purchase orders.

Priority ratings to purchase capital equipment or additions exceeding the $500 and $1500 limits should be obtained by applying to the local War Production Board offices for Form PD-1A for equipment only and on Form PD-200 where the addition also involves construction. Chlorine appears to be *relatively* noncritical now and although there are still restrictions, it may be obtained for both potable and industrial water treatment and for sewage treatment by simply endorsing purchase orders with the proper certification. W&T's Priorities Letter W-7, which contains the meat of Order U-1 may be obtained by addressing a request to Priorities Dept., Wallace & Tiernan Co., Newark, N. J.

"How to Make Your Safety Equipment Last Longer" is a comprehensive 32 page handbook just published by Mine Safety Appliances Co. of Pittsburgh. Covering every type of personal protective equipment, from Protective Hats, Gas Masks, Respirators and Gas Instruments, through the list to Safety Clothing, this well-illustrated publication details the practical "do's and don'ts" of safety equipment care in a form readily adaptable for instruction of equipment users. The section on various methods of sterilization for masks and respirators is thoroughly handled, as are other sections in the book. Attention is given to many common-sense methods for repair and preventive maintenance of articles on the hard-to-get list. Illustrated throughout by marginal drawings pertinent to the text, the M.S.A. Conservation Handbook is available without cost to any responsible official, upon request to Mine Safety Appliances Co., Braddock, Thomas and Meade Streets, Pittsburgh, Pa.

MORE FERTILIZER IS NEEDED and Your City Can Provide It!

There is an outspoken appeal to sewage disposal plant operators in the accompanying newspaper article. Your plant cannot produce guns, tanks and planes, but you do have the means to increase America's food output, which must feed many millions of people overseas as well as our own population. The sewage sludge which, up to now has been burned or buried, has—when properly prepared—the makings of a valuable fertilizer.

Sewage disposal plants in all parts of the nation are turning the cost of sludge disposal into profit and producing a marketable fertilizer with the Royer Sewage Sludge Disintegrator.

The Royer thoroughly shreds, mixes, aerates and further dries sludge; sticks and stones are removed. There is a ready market for Royer-prepared fertilizer among truck farmers or under-glass growers. Any surplus can be used for Victory gardens or in the city parks, where the Royer is also utilized for mixing top dressing.

Royers are available in twelve stationary and portable models, and in sizes for every plant; electric, gasoline engine and belt-to-tractor driven.

Write for new "Sewage Sludge Utilization Datalog".

THE ROYER

FARMERS FACING ACUTE SHORTAGE OF FERTILIZERS

BY GAIL COMPTON.

Tight federal control of the nation's supply of fertilizer is forcing the farmer to fall back on natural methods of maintaining the fertility of his soil. As a result of fertilizer rationing the farmer is changing his planting program and adopting new crop rotations.

More than 2,300,000 farmers in the nation use approximately 9 million tons of commercial fertilizer each year, costing them around 300 million dollars. The greatly expanded farm program stemming from the war has created a fertilizer shortage. Chemical nitrogen, one of fertilizer's most important elements, is needed for the war; consequently its production for other purposes has been limited.

Big Shortage Forecast.

In 1936-'40 agriculture spent 2.53 per cent of the national farm income on fertilizers; if the same percentage is spent this year there will be an added demand for more than 4 million tons. Last year the demand exceeded the supply by approximately 750,000 tons. This year demand will exceed supply by more than 3 million tons.

For these reasons experts predict a shortage of fertilizers thi

Reprinted from the Chicago Tribune.

Below: Model "NSB-4" shredding, aerating and loading truck with a much needed soil builder.

ROYER FOUNDRY & MACHINE CO.
170 PRINGLE ST., KINGSTON, PA.

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Charcoal iron bolts for Cast Iron Pipe and Fittings. Write for Prices.

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1221 PINSON ST. BIRMINGHAM, ALA.

Reeves Variable Speed Transmission, with built-in reducer, is a recent addition to the line of the Reeves Pulley Company of Columbus, Ind. Catalog Tr-432 describes this equipment which combines the variable speed mechanism and gear reducer in a single compact unit. The catalog not only describes the equipment but also how the Reeves Transmission provides any driven machine with complete speed adjustability with positive power transmittal. For any water or sewage plant having a machine shop or other equipment utilizing variable speed, this catalog which contains composite dimensional diagrams and tables of H.P. and speed rating, may be of interest. It may be obtained by writing the Reeves Pulley Co., Columbus, Ind.

Atomizing Type Aerator for pretreatment of laundry and related trade wastes described in Bull. No. 141 of the Pacific Flush Tank is the same equipment described in Bull. 140 and 142 for the treatment of sewage and supernatant liquor respectively. This "Atomizing Aerator" consists essentially of a chamber to which is applied a vaccum of approximately 3 in. of water by means of an exhaust fan. The aerator produces a finely divided liquid suspension with the solids entrained in motion in a comparatively large volume of air. This particular bulletin (No. 141) not only presents diagrams of the aerator system, design factor, layouts, but also information on the laundry waste problem, the quantity of waste and analysis, effectiveness of treatment, and specifications for equipment. Bull. No. 141 and its companions (No. 140 and 142) may be obtained by writing the Pacific Flush Tank Co., 4241 Ravenswood Ave., Chicago, Ill.

Ohmite Manufacturing Co. of Chicago, in Catalog No. 18 presents a complete line of rheostats, resistors, tap switches, chokes, and attenuators, for radio, television, sound, electronic, and industrial uses. Included in the products listed are vitreous enameled rheostats, "Dividohm" adjustable resistors of 10 to 200 watt ratings, fixed resistors of the same rating, other types of fixed and non-inductive resistors, precision resistors (1 per cent accurate), ceramic open type tap switches, high current power tap switches, and a soldering iron control rheostat. Although designed primarily for the electronic industry, indus-

trial applications are not infrequent and it is probable that water or sewage plants will have a use for some of this equipment. For Catalog 18 interested persons should write the Ohmite Manufacturing Co., 4835 W. Flournoy St., Chicago, Ill.

"Blackout of Algae with Activated Carbon" is the title of a progress report by John P. Harris in the *"Taste and Odor Control Journal"* published in April, 1943, by the Industrial Chemical Sales. This issue is devoted to the experiences of water works plants in applying activated carbon to basins and reservoirs for the control of algae growths. Reports from three plants, large, medium and small, are included.

"Algae Blackout" with activated carbon provides an artificial means of excluding, by placing a carbon "blanket" on the water surface, so that algae and other organisms will not grow. There is an added benefit of accomplishing the removal of tastes and odors also.

At the St. Louis County Water Co., Herbert O. Hartung reports that "Activated carbon has been applied to the 30 m.g. reservoir covering 380,000 sq. ft., solely to exclude the sunlight essential for the growth of algae. The carbon, figuratively, was used to put a cover over the basin protecting the water and reservoir bottom and walls from the piercing sun rays. Consequently, no carbon was added to the reservoir water at night or on sunless days. Algae growth has been almost completely eliminated by these carbon applications; and only about a barrel of copper sulphate was required in 1942 as compared with high copper sulphate use in the past."

Martin M. Symons, Chief Engineer of the Interstate Water Co., Danville, Ill., reports on algae blackout practice in his plant serving approximately 40,000 persons. In a supply which suffers not only from algae growths but also tastes and odors due to turnovers in an artificial lake, the use of activated carbon has proved efficacious. States Mr. Symons: "The settling basin for a normal pumpage of 5 m.g.d. provides a retention period of 8 hours. Activated carbon, alum, lime, and ammonia and chlorine are all added some 300 ft. before the water enters the settling basin. The Nuchar certainly does give a very efficient blackout in the out-

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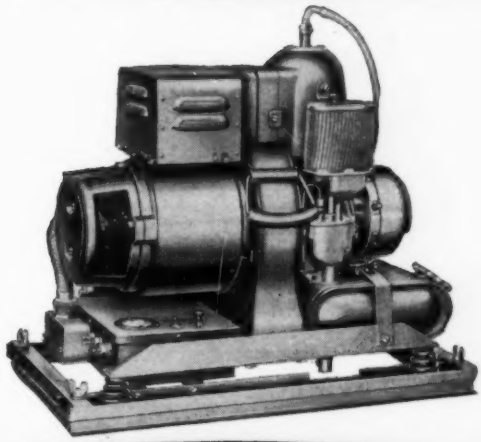
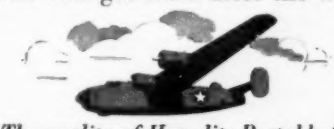


Portable Generators

The old Homelite story now has a new twist. Homelite Portable Generators have had plenty of experience in helping to speed emergency repairs . . . and, for that matter, they're still doing it.

But the big job now is to meet the greatest emergency of all time . . . *the war.* Therefore, all new Homelite Generators must go to the Armed Forces . . . to help our Air Force, Tank and Signal Corps do their jobs better and faster.

To meet the requirements of our fighting forces, many improvements have been added to Homelite Portable Generators. Our new models are more powerful, more rugged, and more able to operate under all conditions than ever before. And because of this they'll be far more valuable to you who will get them after the war.



The quality of Homelite Portable Generators — now produced in huge quantities — has earned the high Army-Navy production award. After the war, we'll produce as well for you.

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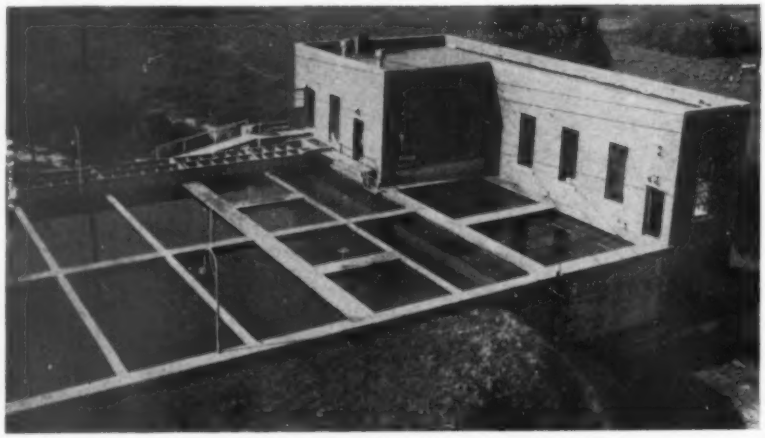
TENNESSEE CORPORATION ferri-floc FERRIC SULPHATE



Dalton, Georgia—Water Softening Plant

Dalton, Georgia, has a unique water treatment problem. The raw water is taken from a mountain stream which is subject to flash floods. Not only does this condition cause a rapid and wide fluctuation in turbidity, but the chemical characteristics have an equally rapid and wide variation.

This raw water problem is further complicated by the fact that the finished water produced must be uniform. This is necessary to meet the needs of the quantity laundering incidental to Dalton's textile industries. In fact, the problem of supplying a uniformly soft water to these laundries led to extensive studies and the redesigning of the plant.

Clark W. Jones, Superintendent of the Dalton Water, Light, and Sinking Fund Commission, and W. L. Avrett, Assistant Engineer of the Georgia Department of Public Health, undertook a series of laboratory studies to determine the most satisfactory and economical means of producing a uniform finished water. These tests showed that lime softening and coagulation with FERRI-FLOC during periods of low turbidity, and alum coagulation with no softening during periods of excessive turbidity, would give a fairly uniform water. Consequently, the rebuilding of the plant was based upon these findings.

When the plant was put into operation on this basis, the next step was to secure an even greater uniformity of the finished water. Plant tests were then undertaken to ascertain whether or not softening could be accomplished during these high turbidity periods.

Once more FERRI-FLOC proved the answer and is now being used at all times to produce a uniform water. Results have been excellent and economies even greater than anticipated.

The City of Dalton is indeed to be congratulated upon the quality of its water supply and its economy of production.

TENNESSEE CORPORATION

ATLANTA, GEORGIA LOCKLAND, OHIO

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MAIN-LINE WATER METERS

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And that's just a reminder of something you already know! Install Sparling Water Measuring Equipment for consistent accuracy. Bulletin 308 will be sent upon request.

R. W. SPARLING

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side settling basin; in fact the water looks like ink. At the worst period of algae growth in the river, the dose of carbon was fifty pounds per million gallons. Constant dosage for blackout of algae growth in the settling basin is effective."

In a "really small" municipal water at Paris, Missouri, Mr. Vester Opie, Chief Engineer, reports that the plan has proved very satisfactory. According to Mr. Opie, four pounds of carbon per 100,000 gallons of water not only shades the sun's rays but also apparently, by virtue of the fineness of the carbon particles, actually clogs the pores of the algae causing death, so that a black line is substituted for the old green line of algae along the walls." This is just an opinion—but who knows?

For a copy of this interesting April issue of "Taste and Odor Control Journal" write Industrial Chemical Sales Div., West Virginia Pulp & Paper Co., 230 Park Ave., New York City.

The Answer to Your Water Leak Problem is given in an eight page folder about the "Universal" Water Leak Detectors and Pipe Locators, manufactured by S. F. Ferguson, Newark, N. J. Complete with pictures, showing the application of the different instruments, the folder describes the principles of operation, the method and practice of locating water leaks, the pipe locator and its method of operation, and the many advantages accruing to the water company which uses these instruments. Two pipe locators, one universal leak locator, two smaller type leak detectors and a combination leak detector and pipe locator are offered by the manufacturer. Tests may be made for leaks in service taps, or under the pavement. The pipe locator will also locate lost or abandoned services, dead ends, lost gate valves, and will differentiate between water and gas mains. For additional information on these instruments write S. F. Ferguson, Douglas Hotel Building, Newark, N. J.

Zinc Paint for Water Tanks is the item of chief interest in the current issue of *"Paint Progress,"* published by the New Jersey Zinc Co. Three 2,000,000 gallon industrial tanks at Palmerton, Pa., have served as an experiment for the past twenty-five years. The New Jersey Zinc Co., which was charged with the upkeep of these tanks, has

developed that the best paint, lasting for seven years, was a formula containing zinc dust and zinc oxide in linseed oil. A picture taken of the interior tank walls after seven years' exposure, suggests the claim that the zinc dust paint is better and affords more protection than red lead or iron oxide-zinc oxide paint. The No. 1 issue of Vol. 4 of *"Paint Progress"* may be obtained from the New Jersey Zinc Co., 160 Front St., New York, N. Y.

"New Water Developments and Wartime Economy," by Robert T. Sheen and Lewis B. Miller, presents a discussion of the published specifications which deal with the quality of process water required for the manufacture of different grades of paper. Treatment methods to fit raw water for specific manufacturing uses are reviewed. Recent progress in analytical plant control for high pressure boilers is touched upon, and recent important articles on the preservation and maintenance of equipment under corrosive conditions are summarized. Designated as Betz Technical Paper No. 82, it will be furnished free on request to W. H. and L. D. Betz, Consulting Chemical Engineers, Gillingham and Worth Sts., Frankford, Philadelphia, Pa.

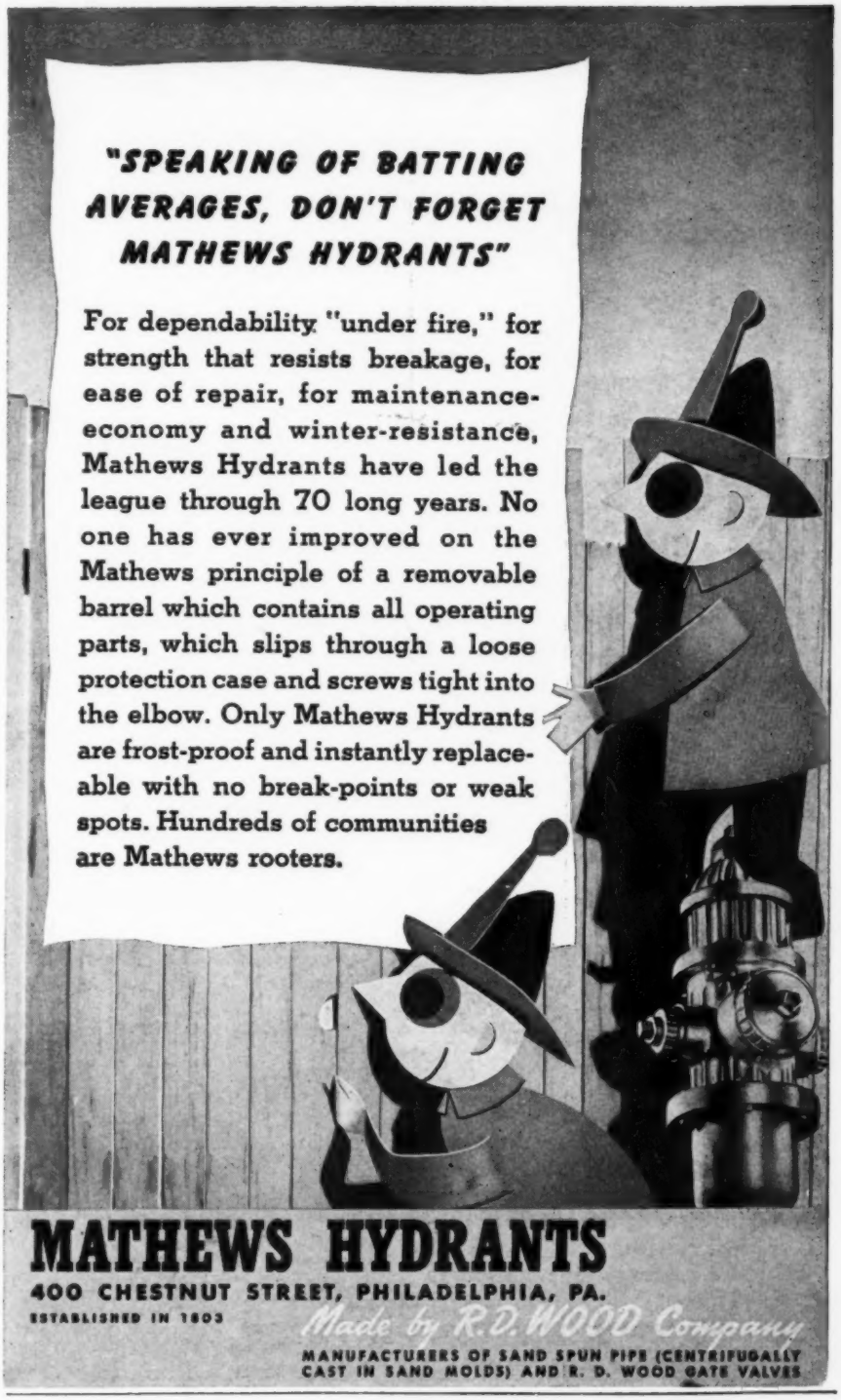
EQUIPMENT NEWS

A New Hypochlorinator

Announced by Jeff Corydon, Who Heads a New Company

Jeff Corydon, well known in the water works and sewage fields during the last 10 years as a pioneer in the development of low cost chemical feeders, hypochlorinators and proportioners, has recently resigned as president of Proportioneers, Inc., of Providence, to form a new company, known as Chem-Feeds, Inc., also of Providence. Mr. Corydon is president of this new company; John V. Lizars is vice-president and manager of the New York office (331 Fourth Ave.); and Jonathan A. Chaffee, Jr., is secretary and treasurer. The company will make hypo-feeders, chlorinators, ammoniators and solution feeders for all chemicals and uses. It will also render an engineering service in connection with proportioning problems.

The first of the new products of Chem-Feeds, Inc., to be announced


"SPEAKING OF BATTING AVERAGES, DON'T FORGET MATHEWS HYDRANTS"
For dependability "under fire," for strength that resists breakage, for ease of repair, for maintenance-economy and winter-resistance, Mathews Hydrants have led the league through 70 long years. No one has ever improved on the Mathews principle of a removable barrel which contains all operating parts, which slips through a loose protection case and screws tight into the elbow. Only Mathews Hydrants are frost-proof and instantly replaceable with no break-points or weak spots. Hundreds of communities are Mathews rooters.
MATHEWS HYDRANTS
400 CHESTNUT STREET, PHILADELPHIA, PA.
ESTABLISHED IN 1803
Made by R.D. WOOD Company
MANUFACTURERS OF SAND SPUN PIPE (CENTRIFUGALLY CAST IN SAND MOLDS) AND R. D. WOOD GATE VALVES

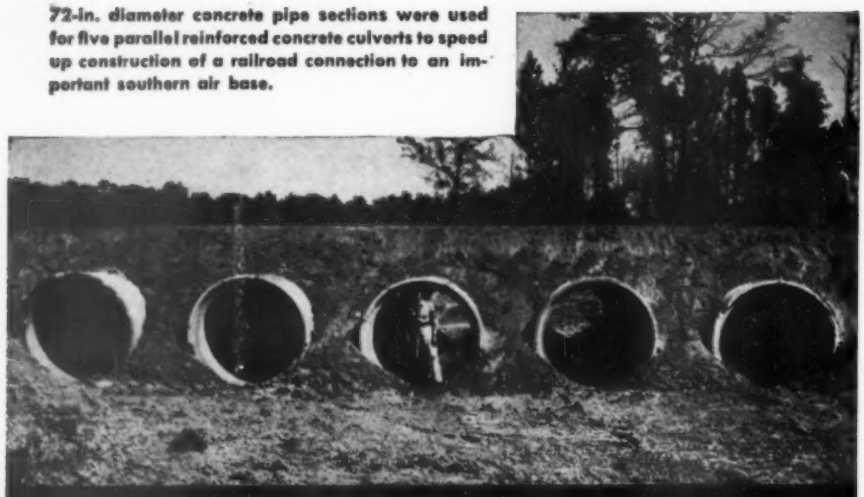
GASKET AND FORM
The Perfected Method for Making
SEWER PIPE JOINTS OF CEMENT

- No jute used—gasket centers spigot.
- Definite space in each joint for cement.
- Form confines cement-grout to lower portion of joint.
- Particularly advantageous in water-bearing trenches.
- Infiltration minimized.

L. A. WESTON Adams, Mass.

ANTHRAFILT
A Filter Medium For All Purposes
ANTHRACITE EQUIPMENT CORP.
101 Park Ave. New York
H. G. Turner Research Engineer
STATE COLLEGE, PA.

72-in. diameter concrete pipe sections were used for five parallel reinforced concrete culverts to speed up construction of a railroad connection to an important southern air base.



CONCRETE PIPE
widely available for vital war projects

Concrete pipe in many instances has helped speed up water, sewerage or drainage projects urgently required in important defense areas.

Concrete pipe combines the qualities of long life, maximum hydraulic capacity, great strength and low annual cost. Evidence of these qualities is found in thousands of concrete pipe installations under highways, railways and major airports as well as in municipal service.

And concrete pipe conserves critical materials. Established concrete pipe manufacturers are ready to serve you in nearly every community.

Technical assistance is available to engineers and builders engaged in important wartime projects involving concrete pipe or any concrete construction.

PORTLAND CEMENT ASSOCIATION
Dept. A5-29, 33 W. Grand Ave., Chicago, Ill.

A national organization to improve and extend the uses of concrete . . . through scientific research and engineering field work

BUY MORE WAR SAVINGS BONDS

EDSON
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Hand Sizes 2", 2½", 3", 4"
Power Sizes 3" and 4"
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Edson Special Suction Hose
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South Boston, Mass.
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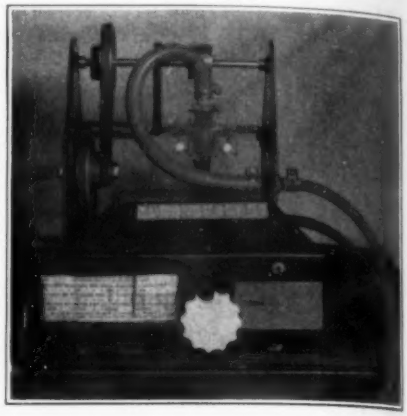
Meter-Master
RATE RECORDER FOR
WATER METERS

Send for Literature

F. S. BRAINARD & CO.
246 Pearl Street, Hartford, Conn.

is the "Hi-speed, Midget Size Var-I-Feeder" for emergency main sterilization or other chlorination usage. It is characterized by extreme portability, the complete outfit, including protective case with test kit and accessories measuring only 10x18x14 inches and weighs only 44 pounds.



This small size is possible because of an unprecedentedly high stroking rate—200 injections per minute as contrasted with the usual 10 to 40. Thus the "Var-I-Feeder" delivers as much chemical per hour as bigger feeders, but delivers it in an approximately continuous stream.

Other features include streamlined through flow, finger tip control of speed and feed while the machine is operating, long life due to short stroke and small diaphragm, and a transparent, illuminated reagent head made of plastic containing a small electric bulb imbedded in the head. This latter feature provides transparent visibility of the apparatus inside, as well as illumination, so the operator can view the reagent, diaphragm and check valve action.

The equipment may be driven by 1/20 H.P. electric motor, gasoline engine, or may be belt driven. Although the "Var-I-Feeder" is precision built, it is protected by a sturdy case, which stacks readily and is easily transported.

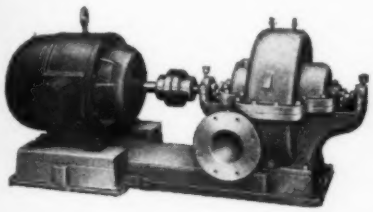
For descriptive literature, write Chem-Feeds, Inc., 77 Reservoir Ave., Providence, R. I.

Aurora Pumps Offering Improved Centrifugals

Aurora Pump Co. of Aurora, Ill., announce an improved line of Type AD Aurora two-stage, horizontally split case centrifugal pumps in ca-

pacities up to 600 g.p.m. and heads to 400 ft. These pumps are a refinement of the former Aurora Type AMB pumps and are distinguished for their streamlined water passages and impellers, both hydraulically coordinated to minimize flow resistance.

The new AD pumps are compact and are readily accessible, due to the removability of the upper half of the



split pump casing without disturbing the suction or discharge connections. These pumps are adaptable to a wide variety of services and are particularly recommended for use in general water supply for municipalities, industrial establishments, office buildings, etc. They are also recommended for the handling of condenser circulating water, wash water, liquids in paper mills and distilleries, chemical solutions, petroleum liquids, irrigation, etc. Descriptive literature and further details may be obtained by writing Aurora Pump Co., 68 Loucks St., Aurora, Ill.

New Close Coupled Pumps by Aurora

Aurora Pump Co. of Aurora, Ill., announce a new line of Type G. M. C. Close Coupled Centrifugal Pumps designed for many services, especially where compactness is at a premium. The impellers and shells are scientifically streamlined in the interest of high efficiency and smooth, quiet performance. The Aurora G. M. C. design of close motor-pump mounting is simple, strong and neat in appearance. Aurora Close-Coupled Centrifugal Pumps are available in a capacity range of from 5 to 1,000 g.p.m. for operation against heads

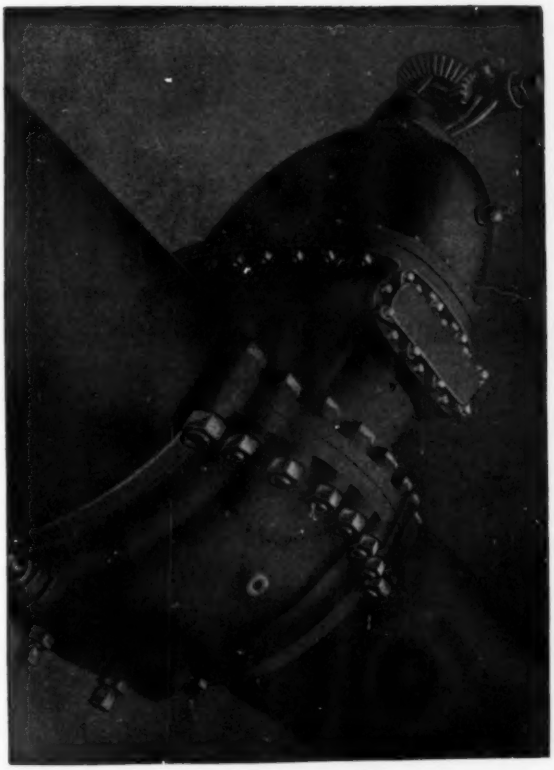
SMITH
INSERTING VALVES

THE A.P. SMITH MFG. CO. EAST ORANGE, N.J.

Symbol of Quality Since 1889

NO SHUT-DOWNS NECESSARY!

Water shut-offs mean Industrial shut-downs, and this in turn impedes the war effort. A valve insertion job does not necessarily mean that you have to shut down service. With a Smith Valve Inserting Machine you can insert valves with the service at full pressure. These machines are made in 6 sizes for inserting 4" to 36" valves, are simple and easy to operate and do a surprisingly quick, clean job.



Showing a 24" valve installed horizontally under pressure.

OTHER SMITH PRODUCTS
Valves and Hydrants — Valve Inserting Machines — Tapping Sleeves — Tapping Valves — Hat Flanges and Water Meters
Write for Catalog

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315 N. Crescent St., Flandreau, S. D.
901 Wm. Oliver Bldg., Atlanta, Ga.
59 Oak Vale Ave., Berkeley, Calif.
542½ First Ave. S., Seattle, Wash.
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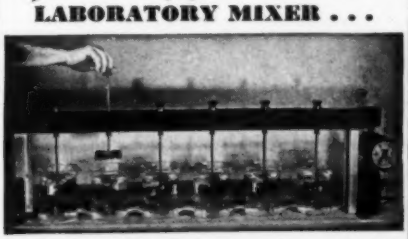
THE A. P. SMITH MFG. CO., EAST ORANGE, N. J.

THE *Phipps & Bird* LABORATORY MIXER . . .



IS the important piece of equipment in the Modern Water Works Laboratory. Now being used by leaders in water works research. Many superintendents and chemists have been able to reduce their chemical costs by the control of chemical dosages with this mixer. Write for literature.
PHIPPS & BIRD, INC. Richmond, Va.

ZECO GREENSAND ZEOLITE

ZECO and HI-ZECO Greensand Zeolite for water softening, filtration and iron removal. ZECO Manganese Zeolite for iron and manganese removal. COREXITE mineral for corrosion control and water stabilization.

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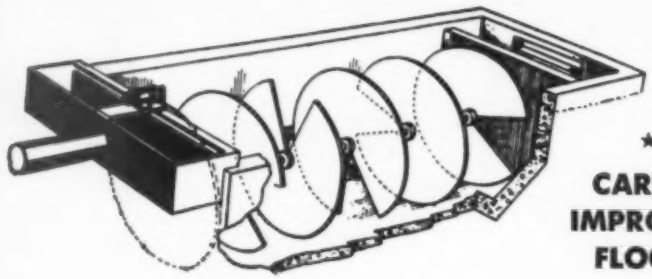
Sales Office: 140 Cedar St. New York, N. Y. Factory: Medford, N. J.
Pioneer Producer of GREENSAND ZEOLITE MINERAL

AERATORS · SIPHONS · WATER SYSTEMS ·



★ CARTER IMPROVED FLOCER

Without Paddle Agitation

★ 10% to 25% shorter detention period.
★ Negligible power consumption.
★ Low cost installation and maintenance.
★ A series of flat discs, each with a segment removed, slowly rotated.
★ Agitation is set up by flow of liquid through the open segments.
★ Settling occurs between discs during the travel of the open segment in the upper half of rotation. Flocs are not cut up with a final result of a floc of sufficient size to settle rapidly by the time the mixture passes into the settling tank.

★

PADDLE TYPE FLOCERS AND AERATORS

Certain conditions require increased air diffusion in activated sludge treatment. The Ralph B. Carter Company manufactures a full line of paddle mechanisms. Careful design of shaft and bearings assure long trouble-free life under the necessarily difficult underwater operating conditions.

SELF PRIMING CENTRIFUGAL PUMPS · HUMIDIFIER PUMPS

SLUDGE PUMPS · FILTERS · CONDITIONERS · MIXERS

RALPH B. CARTER COMPANY

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HACKENSACK · NEW JERSEY

DOW

FERRIC CHLORIDE

35-47% SOLUTION
Shipped in Tank Cars

60% CRYSTALS
Packed in 300 or 500 lb. Barrels

★ SLUDGE CONDITIONING

★ SEWAGE COAGULATION

★ WATER PURIFICATION

THE DOW CHEMICAL COMPANY

MIDLAND MICHIGAN

up to 100 pounds per square inch. Further details may be obtained from Aurora Pump Co., 68 Loucks St., Aurora, Ill.

New Line of Gearmotors Announced by Westinghouse

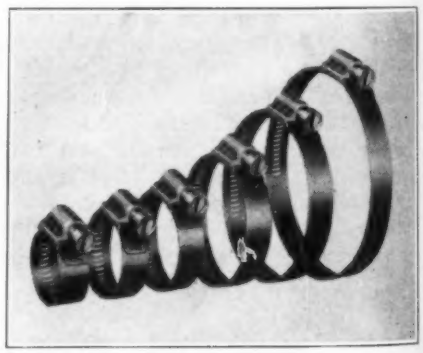
A new line of horizontal parallel shaft type Gearmotors which meet speed reduction requirements for a wide variety of industrial applications over a range of 1 to 75 hp. is announced by Westinghouse. Each new unit conforms to A. G. M. A. standard output speeds and application practices.

The use of adaptor castings between motor and mechanical parts allows the use of all standard Westinghouse N. E. M. A. frame motors with each type of unit, and types of motor construction can therefore be readily changed to suit varying service conditions if necessary in the field.

Gears and pinions are of .40-.50 carbon steel and are given special heat-treatment before hobbing to produce a tapering hardness from surface to core, resulting in tough, impact-resisting teeth. Gears and bearings are lubricated by a positive splash system. The new Gearmotors feature compactness and improved foundation stability. Further information on this complete new line of Gearmotors may be secured from Department 7-N-20, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

New Hose Clamp with Novel Features

Aircraft Standard Parts Company, Rockford, Ill., has recently introduced a new line of "Aero-Seal"



hose clamps in fourteen sizes from ¾ inch to 4 inches inside hose diameter. These clamps have been designed with a number of improved and interesting features based on requirements set forth in Army Air

"Varec"

It's the SANITATION ENGINEER'S 'BY-WORD' FOR Complete SEWAGE GAS CONTROL . .

The new "VAREC" approved Pressure Relief and Flame Trap Assembly, Fig. No. 440, is one of the many "VAREC" products described and illustrated in detail with flow charts, diagrams, and engineering data in the "VAREC" Sewage Gas Control and Safety Devices Catalog, S-3. A copy of this "Sanitation Engineers' By-word" is yours for the asking.

OTHER "VAREC" PRODUCTS

Flame Trap Assemblies, Pressure Relief & Vacuum Breaker Valves, Flame Arresters, Waste Gas Burners, Flame Checks, Regulators, Check Valves, Sediment Traps, Drip Traps, Manometers, Explosion Relief Valves, Handhole Covers, and Sampling Hatches.

The Vapor Recovery Systems Co.
Branch Offices: COMPTON, CALIF. Stocks Carried:
NEW YORK CITY · TULSA, OKLA. · HOUSTON, TEX.
Agencies Everywhere

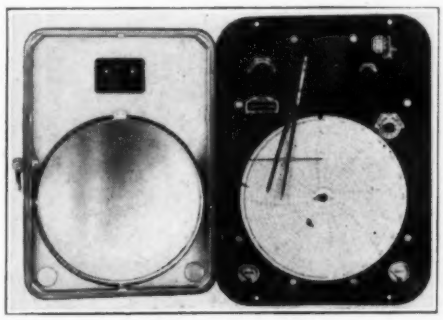
Force Specification No. 25529. The "Aero-Seal" hose clamp consists of a 9/16-inch tempered steel band punched with holes corresponding to the teeth of a worm gear. These holes mesh with a worm in the housing welded to the fixed end of the band. The worm is turned by a screw driver, and the screw head on the worm is fitted with a safety cup which prevents the screw driver from slipping and puncturing the hose or damaging other equipment. Rapid action is obtained by a ten pitch thread so that full take-up is obtained with only a few turns of the screw driver. The belt-like tightening action produces a uniform tangential pull which does not distort the pipe and results in a leakless clamping action. Ease of removing and applying is a feature.

It is possible for six sizes of the "Aero-Seal" hose clamp to cover the total range from ¾ inch to 4 inches. The band has a total take-up of 3 inches (2 inches and 2½ inches on the smaller sizes) and can be tightened considerably below nominal size by letting the free end of the band come through the housing a couple of inches.

The clamps are self-locking because of the worm and worm gear action and resist loosening even with severe vibration as long as the band is under tension.

New Air-Operated Controller Developed by Bristol

A new air-operated automatic control instrument, known as Convertible Free-Vane Controller, has



just been announced by The Bristol Co., Waterbury, Conn. The new instrument is made for automatically controlling temperature (up to 3600° F.) flow, liquid level, pressure, draft humidity, pH value, and time programs.

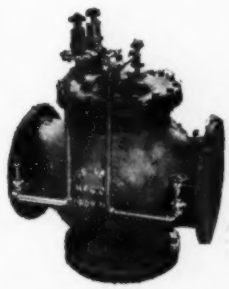
The Convertible Free-Vane Controller operates on the same basic Free-Vane principle as that used in previous models offered by the company. In the Convertible-Type Con-

· 1879 ·
ROSS
AUTOMATIC VALVES

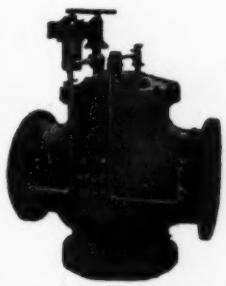
ALTITUDE VALVES • SURGE • RELIEF • BACK PRESSURE VALVES

FLOAT VALVES • REDUCING AND REGULATING VALVES

ALTITUDE VALVES
for
Control of elevation and heads into and out of tanks, basins and reservoirs.
1. Single acting.
2. Double acting.
3. Combination assembly for three or more automatic operations.



COMBINATION VALVE
Combination automatic control both directions through the valve.
A self-contained unit, with three or more automatic controls.



REMOTE CONTROL VALVE
Electric remote control—solenoid or motor can be furnished.
Adapted for use as primary or secondary control on any of the hydraulically controlled or operated valves.

ROSS VALVE MFG. CO.
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P. O. BOX 595, TROY, N. Y.

STEWART SEWER CLEANING EQUIPMENT
MACHINES LEASED OR SOLD

WOODEN & STEEL SEWER RODS • STEEL TAPES • ROOT CUTTERS • SEWER CLEANING BUCKETS • CABLE

JUMBO NO. 10 HEAVY DUTY WOOD RODS

Made of Selected Hickory with strong Malleable Iron Couplings, in 2½, 3, 3½ and 4 ft. lengths. Triple Lock, impossible to buckle or uncouple in the sewer. The tongue and groove feature eliminates wear on hook, increasing the length of service.

FREE TRIAL — THE RODS MUST PAY FOR THEMSELVES

Write today for Complete Catalog

MANUFACTURING SEWER CLEANING EQUIPMENT SINCE 1901

W. H. STEWART

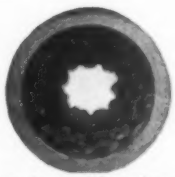
P.O.B. 767 • Syracuse, N. Y.

THE NATIONAL METHOD • OVER 35 YEARS EXPERIENCE

GUARANTEED TO RESTORE 95% ORIGINAL CAPACITY

DEFENSE DEMANDS

FULL CAPACITY MAINS



Before Cleaning

After Cleaning

MANY cities that now find their water supply resources sadly overtaxed by the additional thousands of water users in defense industries and nearby army training camps, are turning to the *NATIONAL METHOD of water main cleaning* as an economical means of improving water service.

Cleaning by THE NATIONAL METHOD restores clogged mains to at least 95% of their original carrying capacity, making unnecessary large expenditures for auxiliary pipe lines, increased power at the pumps, new standpipes, etc.

The NATIONAL METHOD

The National Water Main Cleaning Co.

30 Church St. Branches: New York

115 Peterboro St., Boston, Mass.
910 William-Oliver Bldg., Atlanta, Ga.
7103 Dale Ave., St. Louis, Mo.
3812 Castellar St., Omaha, Neb.
406 Fla. Theatre Bldg., Jacksonville, Fla.
205 W. Wacker Dr., Chicago, Ill.
501 Howard St., San Francisco, Calif.
2028 Union Ave., Montreal, Can.

troller a number of design refinements have been incorporated, which simplify the instrument and make it more convenient to service. The new instrument is also designed so that the user can convert from one type of control system to another.

The adjustments for fitting the controller to the requirements of the process are loacted on a dial board above the chart.

For descriptive literature write The Bristol Co., Waterbury, Conn.

General Electric Announces New Line of Totally Enclosed Motors

A new line of totally enclosed motors, the most recent addition to the widely known group of Tri-Clad motors, has been announced by the Motor Division of the General Electric Co. Available in both induction and capacitor type, the motors are designed for use where abrasives, chemicals, rain, snow, and dirt are encountered. These new motors, which are interchangeable in mounting with the Tri-Clad open motors of the same rating, are available in various frame sizes, h.p. ratings and r.p.m. They are protected against physical damage, electrical breakdown, and normal operating wear and tear. Leads are permanently encased in compound in a cast-in pocket in the stator frame, thus preventing liquids from seeping into the motor; a rotating labyrinth seal prevents dirt, oil or water from entering the bearing housing. For further information write the General Electric Co., Schenectady, N. Y.

New Color Coating for Masonry

"Colorthru," a finish coat in color for masonry, needing no priming or undercoat, is a new product manufactured by Colorthru Chemical Co. of New York. One coat brushed or sprayed on floors and walls penetrates, waterproofs, preserves and beautifies concrete, brick, stucco, or other masonry, whether inside or outside, painted or unpainted. It can be applied to old or new masonry, even when wet. No priming is necessary, thus effecting a 50 per cent saving in labor cost which may be 80 per cent of the total cost of a painting job. One gallon, at $5.35, covers 400 sq. ft. For further details address the Colorthru Chemical Co., 20 W. 45th St., New York, N. Y.

RODNEY HUNT

FLOOR STANDS

Photo shows an Improved Rodney Hunt Floor Stand. It is equipped with efficient anti-friction bearings and is more compact and lighter than other models. This floor stand is available in a wide range of sizes and gear ratios for various loads. Rodney Hunt also makes timber and metal gates, gate hoists, flap and mud valves, and other types of dependable canal equipment, a field in which Rodney Hunt has pioneered for over 100 years.

Write for Special Catalog Today.

RODNEY HUNT

RODNEY HUNT MACHINE CO.

118 Lake Street, Orange, Mass., U. S. A.

STEEL TANKS CANNOT BE REPLACED NOW

PROTECT YOUR TANKS, CLARIFIERS, FILTERS, etc. WITH

The RUSTOP (Cathodic) System. Completely protects all types of submerged metals from corrosion.

CLEANS OLD TANKS
KEEPS NEW TANKS CLEAN

Greatly prolongs useful life of costly equipment. No service interruptions for installation. Materials now available.

THE APPROVED METHOD

RUSTOP THE CATHODIC SYSTEM OF CORROSION PREVENTION

ELECTRO RUST-PROOFING CO.

DAYTON • OHIO

P & H Now Offering A.C. Arc Welders

Harnischfeger of Milwaukee announces the addition of a complete line of Industrial A.C. Arc Welders to its present line of P&H D.C. machines. Engineered and built for industrial service, these machines are being made in 7 Heavy Duty and 4 Intermittent Duty models with a range of capacities for handling production welding under continuous operation. Setting and control of current throughout complete welding service range involves one simple, easy-to-operate adjustment. Improvements in the P&H control over other designs make it creep-proof.

According to P&H engineers, the A.C. models are marked by a number of other mechanical and electrical refinements which, by actual field tests, have shown an increase in operating efficiency up to as high as 95% with appreciably reduced maintenance cost. For complete details of these new products, address the Welder Division, Harnischfeger Corp., Milwaukee, Wis.

WITH THE MANUFACTURERS

Climax Engineering Interests Buy McAlear Manufacturing Co.

Ownership of McAlear Manufacturing Co., Chicago, producer of valves, regulating and control equipment, has been acquired by the interests controlling Climax Engineering Co. of Milwaukee, Wis., a leading manufacturer of internal combustion engines, power units and generating sets.

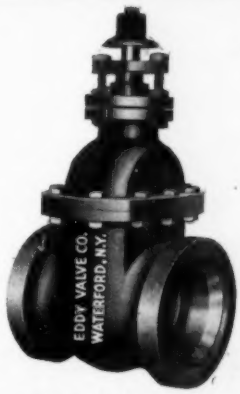
Edward F. Deacon, Climax president, will also be president and general manager of the McAlear Company. Both companies are subsidiaries of General Finance Corporation. Mrs. P. G. McAlear, formerly president and now chairman of the board of the McAlear Company, will continue to be actively identified with the management.

Products manufactured by McAlear are widely used in the same fields served by Climax and the move is expected to help both companies to broaden their service to customers

EDDY

FIRE HYDRANTS AND VALVES—

WATER WORKS EQUIPMENT



EDDY VALVES
For
Water Works
and
Sewage Disposal
Plants

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Waterford, N. Y.

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For Fire Protection Service

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WATERFORD, N. Y.

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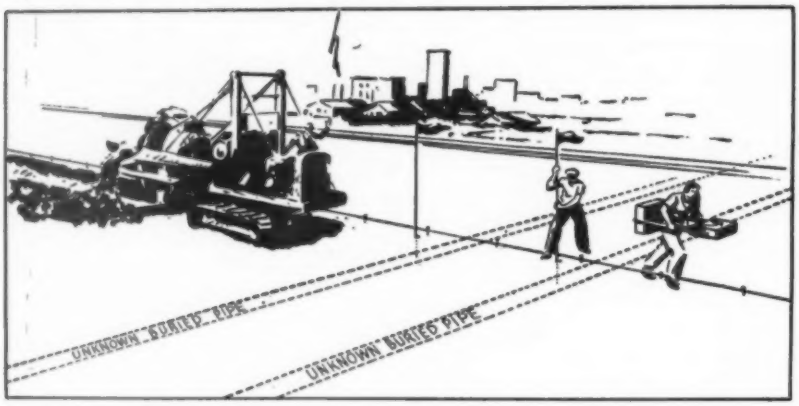
BURIED PIPE AND CABLE FINDER



The M-Scope is solving—successfully—the varied problems involved in the development, operation and maintenance of buried pipe and cable systems and is in daily use by representative organizations in such important groups as:

Government Projects	**Airports**
Municipalities	**Public Utilities**
Sewerage and Water Plants	**Industrial Plants**
Consulting Engineers	**Oil and Pipe Line Companies**

Watch for our series of monthly advertisements in *W-W-& S* regarding the use of the M-SCOPE.

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DIRECT TELETYPE BY POSTAL TELEGRAPH PALO ALTO, CALIF.

84" pipe—Spring Lake, N. J.

FLANGED PIPE

FLEXIBLE JOINT PIPE

BELL & SPIGOT PIPE

SPECIAL CASTINGS

SHORT BODY BELL & SPIGOT SPECIALS

Large stock enables us to make prompt shipments.

CAST IRON PIPE

SIZES 2" TO 84"

Warren Foundry & Pipe Corp.

11 Broadway, New York

Warren Pipe Company of Mass., Inc.

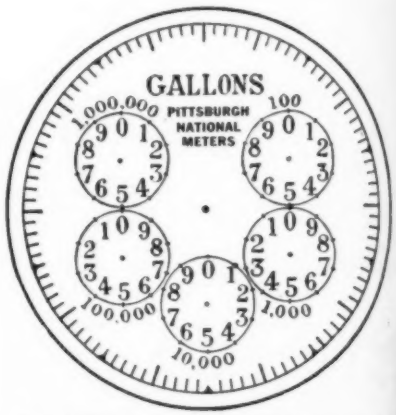
75 Federal St., Boston

in the oil industry and in the industrial and export fields.

Currently both companies are substantially engaged in the production of essential war goods, and on May 7 the Army-Navy "E" Award will be conferred on Climax Engineering Co. and its employes for high achievement in the production of war materials.

Pittsburgh Meter Offers Customer Meter Reading Cards

According to the Pittsburgh Equitable Meter Co., a good many water departments are printing cards that show a facsimile of the meter register dial. These cards are left at premises where the meter reader cannot gain access at the time of his regular call. Printed instructions



Facsimile of one of several types of meter dials made available by Pittsburgh Equitable Meter Co., Pittsburgh, Pa., for printing customer meter reading cards.

ask the consumer to mark the position of the hands of the meter on the imprinted dial and drop the card in the mail. This practice largely eliminates call-backs, conserves gasoline and rubber and alleviates to some extent the man power shortage.

As a cooperative measure, the Pittsburgh Equitable Meter Co. will furnish, without charge, suitable printing plates for any type of Pittsburgh or National meter register, to be used in preparing cards similar to that described above. Address such requests to the nearest branch office or direct to the Advertising Department at 400 N. Lexington Avenue, Pittsburgh, Pa. Indicate the type of meter for which the register facsimile is desired (Arctic, Tropic, Keystone, IMO, Nash, Empire, etc.) and specify whether the dial should be of the round reading or straight reading type, recording in gallons or cubic feet.

NATIONAL GATE VALVES

You can specify National Gate Valves for Water Works operation with full assurance that their time-tested designs and husky construction will operate with fool-proof dependability. The National line of Water Works and Sewerage specialties is complete . . . special designs developed promptly by our engineering staff.

NATIONAL MACHINE WORKS
1559 N. Sheffield Ave. Chicago, Ill.

Fred Deutsch Made Vice President of Everson Mfg. Co.

At the recent annual meeting of the Everson Mfg. Co., Fred W. Deutsch was re-elected to the Board of Directors as well as to the Vice President's office.

Mr. Deutsch has been connected with Everson since the beginning of the year 1939 and prior to that time was employed for approximately 12 years by the Permutit Co. His entire business career since leaving Stevens Institute of Technology has been connected with the water treatment field. Everson has just announced a new portable "Sterelator" for emergency and main sterilization purposes and general use.

Army-Navy E Awards

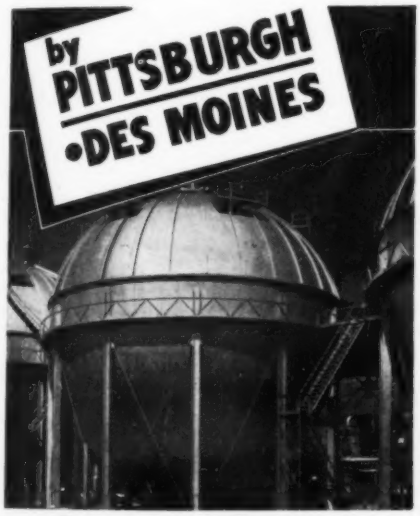
Since our last issue announcement has reached us that 47 additional industrial plants have been granted the Army-Navy Production Award for outstanding performance on war work. Included in the list are several whose works and interests are related to water purification and sewage treatment field. These include Johns-Manville in Manville, N. J.; the Moore Steam Turbine Division of the Worthington Pump and Machinery Corp., Wellsville, N. Y.; the Dow Chemical Co., Climax Engineering Co. of Milwaukee, and the Chicago Bridge & Iron Co., Chicago.

Each will be privileged to fly the Army-Navy Production Award pennant and all civilian employes will be awarded Army-Navy "E" pins.

An Outstanding Example of Modern Packaging

With Information Labeling Featured

The Joseph Dixon Co., 116 year old pioneer in the manufacture of graphite products, has started on a course of "Informative Labeling" in modern packaging. The packaging in this instance is of certain sizes of dry lubricating flake graphites, and the package has been selected



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FOR LIQUIDS AND GASES

Steel storage spheres for gases and volatile liquids under pressure are a Pittsburgh-Des Moines specialty — proving in performance the superior research and craftsmanship which enables better efficiency and longer service life. Write for a consultation!

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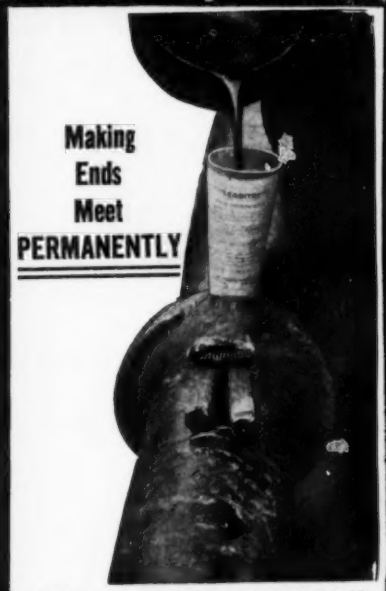
The Pioneer Self-Caulking Material for C.I. Pipe



THE LEADITE COMPANY
Girard Trust Co. Bldg., Philadelphia, Pa.

No Caulking

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P. O. BOX 1122 LOUISVILLE, KY.

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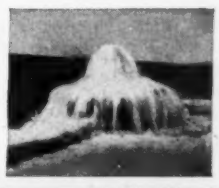
A Size and Type to Fit Your Problem in Water or Sewage Treatment.



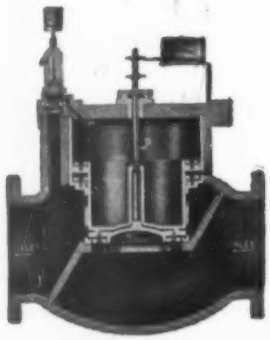
WRITE FOR INFORMATION

Electric Double Cushioned Check Valve

This valve is for use in connection with remote tank storage service with valve located adjacent to motor centrifugal pump, also where a high-low pressure or float-operated switch located at tank is wired to the valve in order to accomplish complete automatic sequence of operation for starting and stopping the pump with respect to storage water levels.

Sizes 3" to 36", angle and globe patterns.

Write for specifications.



GOLDEN-ANDERSON VALVE SPECIALTY CO.
Fulton Building Pittsburgh, Pa.

For WAR EMERGENCIES

M H

VALVES
HYDRANTS
AND WATERWORKS ACCESSORIES

M & H products, including pipe line accessories, are well known for high quality of material and expert workmanship. They are made according to standard specifications and have been used for many years throughout the country. Write for Catalog No. 34.

M & H VALVE
AND FITTINGS COMPANY
ANNISTON, ALABAMA

as the "tutor," or medium for orienting the user with a broader understanding of the techniques of using graphite.

The new container with lithographed decoration in attractive color scheme, shows eight realistic pictures of primary uses of flake graphite made from actual photographs taken at points of use. Attached to the back panel of the container is a 13-page booklet titled "New Graphite Know-How Package," which in text form explains in a practical way numerous important applications of graphite in addition to giving other helpful directions for using graphite in combination with other ingredients. There is a "tear-out" inquiry page to be returned to the manufacturer for information on all other products the company manufactures. Three pages in color highlight other products with thumbnail copy. On the cover of the booklet is a picture of the previous long-used container, which the new "Know-How" package replaces. This avoids confusion by the buyer in content identity.

On the front main panel of the container, in large type for reading at fifteen feet, appears the name and trade designation of the product. Contrasting color band at the bottom identifies the brand, making it easy for the distributing trades to visually distinguish different products. All of this being accomplished by the package itself, makes unnecessary the employment of comparatively expensive directions as separate folders, which are often lost or thrown away.

H. E. Goss Joins Clayton Manufacturing Co.

Indicative of the rapid expansion of the Valve Division of the Clayton Manufacturing Co. at Alhambra, Calif., is the addition to the sales promotion staff of H. E. Goss. Mr. Goss brings to his new connection a wealth of executive and sales experience in the valve and plumbing fixture field.

A native of Portland, Ore., he began his business career with the Crane Co. in that city. His return to Southern California is somewhat of a home-coming inasmuch as he opened a branch for Crane in Pasadena in 1922. He remained in this position until 1937, when he was promoted to the managership of the plumbing section of the Crane Co. general offices in Chicago. He filled this latter post until 1939, when he

INQUIRIES INVITED on all Problems of WATER TREATMENT

Whether your problem of water rectification is large or small, we have a form of equipment to serve your needs. We manufacture and install equipment for Gravity Filtration and Softening Plants; Pressure Filters and Zeolite Softeners; Swimming Pool Recirculating Appliances; and Water Treatment Units of all types.

ROBERTS FILTER MFG. CO.
607 COLUMBIA AVE.
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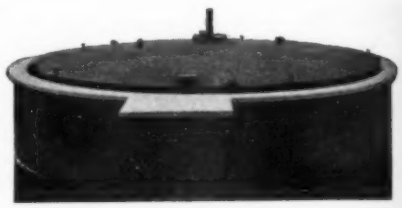


Over 225 P. F. T. Floating Covers in War Service

The health of our fighting men and war workers is being safeguarded by modern sewage disposal plants. We are doing our part by delivering on time P.F.T. Floating Covers and other sewage treatment equipment.

The P.F.T. Floating Cover for single and stage digestion hastens the digestion process, and provides for utilizing the sewage gas to heat water for the digester tank.

Catalog No. 232 contains complete information, including specifications. Write for your copy.

P.F.T. PACIFIC FLUSH-TANK CO.
4241 Ravenswood Ave., Chicago, Ill.
New York Charlotte, N. C.

was transferred to the managership of the same company's branch in Davenport, Iowa. He went to his present position with Clayton Manufacturing Co. from Davenport.

Philadelphia Quartz Have New Patent on Water Purification

A process patent (U. S. Pat. No. 2,310,009) for water purification by a special coagulation aid has been granted to Chester L. Baker and Charles H. Dedrick and assigned to the Philadelphia Quartz Co.

The patent covers a method for preparing a special solution of sodium silicate and a metal salt, which mixture is introduced into raw water prior to the addition of the coagulant. This coagulation aid is for the purpose of inducing a more rapid formation of larger floc, thus removing a higher percentage of the suspended impurities. The silicate-metal salt method has already been used in several water purification plants.

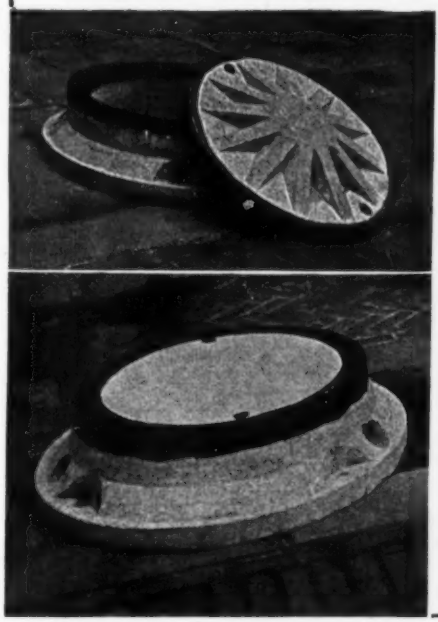
For information on its method of application, write to the Philadelphia Quartz Co., 121 S. Third St., Philadelphia, Pa.

The War Production Board Says . . .

"NO MORE MANHOLE COVERS of Cast Iron"

But six months before this order was issued the Cast Stone Institute and United Concrete Form Products had developed a reinforced concrete manhole frame and cover which were in commercial production throughout the country.

Only this concrete manhole cover offers these advantages:

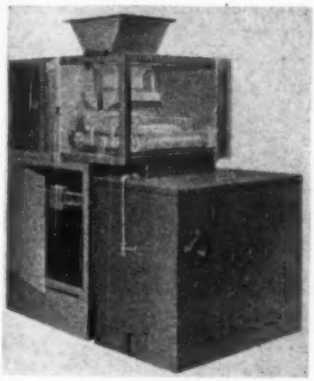


- **Light in weight (cover weighs only 90 lbs.)**
- **Carries H-20 Highway loading (16,000 lbs. plus 25% for impact)**
- **Exposed edges "Armored" to prevent chipping due to either rough handling or wear.**
- **Saves vital steel for its important war job: meets requirements of the War Production Board.**

Write for the address of the distributor in your locality . . .

UNITED
CONCRETE FORM PRODUCTS CO.
5243 W. 25th Place, Chicago
101 Park Ave., New York City

OMEGA BELT TYPE GRAVIMETRIC FEEDER



Weighs the material as it is fed on a short section of conveyor belt which is mounted on accurate scales. These feeders may be connected directly to large overhead storage bins if desired.

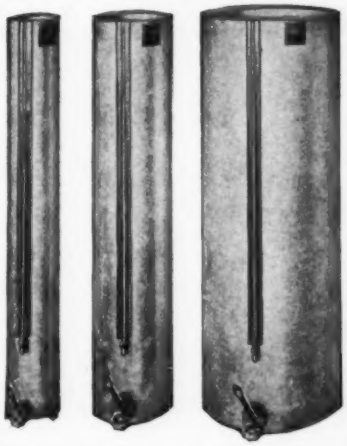
Accurate feeding range is from 5 lbs. to 3,000 lbs. per hour. A totalizer shows the number of pounds of material that have passed through the feeder.

The last word in Chemical Feeders

OMEGA MACHINE CO.
4010 Penn Ave., Kansas City, Mo.

CALIBRATED TANKS

Accurate, durable and dependable. Made in five sizes; calibrated in gallons and cu. ft., also in percentages fast and slow.



These tanks are made of heavily galvanized steel, have quick opening drain valves and brass gauge strips.

FORD METER BOX CO.
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HYDRO-TITE

HYDRO-TITE — The self-caulking joint compound that makes cast iron water pipe joints — strong — tight — flexible and everlasting. Used on thousands of miles of pipe with a record of more than 30 years without a failure.

FIBREX — The sanitary paper packing that is used like braided jute. Free from bacteria — treated with a water repellent —put up in 60 pound reels. 70 pounds of Fibrex takes the place of 100 pounds of braided jute.

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Administration and Operation

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Bureau of Sewers, Baltimore, Maryland

673 pages, 6 x 9, 177 tables, 167 diagrams, charts, graphs, and illustrations, $6.00

This practical manual comprehensively presents the problems of administration, operation, maintenance and design of sewage-treatment plants, and how to handle them.

Drawing upon actual operating results and experience obtained at a large number of outstanding sewage works, this book covers sewage treatment in a thorough and practical manner—from characteristics and composition of sewage, through the various stages of treatment, to its eventual disposal.

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AND SAVINGS STAMPS

WHEN THE TOWN IS "FULL UP..."

HEALTH RECORDS HINGE ON

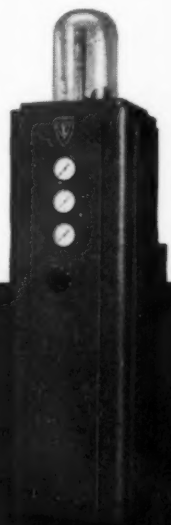
MORE EFFECTIVE *Chlorination*

America's wartime public health record is highly favorable, even in cities jam-packed with war workers. An important contributing factor has been the successful protection against water-borne disease, maintained in spite of overloaded water treatment facilities.

In many such cities, the need to stretch capacity of the water plant has put more responsibility than ever on *chlorination.* Even without the purchase of additional equipment, these plants have found it possible to use their W&T Chlorinators more effectively to reduce the filter load and to supply safe water at rates above the normal treatment capacity of the plant.

In other cases, W&T Emergency Chlorinators have provided the fastest, most direct way to cut in temporary supply sources without sacrificing safety.

If there's a chance that your water system is likely to face this problem — check now with your W&T Representative as to ways and means of using chlorination to see you through. SA-148



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